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Mr. Randy Matty, P.E.
Air Management Engineer
Wisconsin Department of Natural Resources
2984 Shawano Ave.
Green Bay, WI 54313-6727

October 9, 2014

RE: Boiler B28 and B09 Stack Test Reports, Report No. 4784C

Dear Mr. Matty:

Enclosed are two copies of the stack test report required by Permit No.: 436035930-P23 condition ZZZ.4.(2). The report details the Total Particulate Compliance Tests performed on Manitowoc Public Utilities (MPU) Boiler No. 8 (B28) on September 9, 2014 and on Boiler No. 9 (B09) on September 10, 2014 in Manitowoc, WI. Airtech Environmental Services Inc. performed the compliance tests and the results are documented in the attached Airtech Environmental Services Inc. Report No. 4784C, dated October 7, 2014.

The summary of the test results are as follows:

Boiler	Constituent	Average Emission Rate lb/mmBtu	Permit Limit lb/mmBtu
B-28	Filterable PM	0.00222	------
B-28	Condensable PM	0.00655	------
B-28	**Total PM**	**0.00878**	**0.03**

Boiler	Constituent	Average Emission Rate Lb/mmBtu	Permit Limit Lb/mmBtu
B-09	Filterable PM	0.00303	------
B-09	Condensable PM	0.00305	------
B-09	**Total PM**	**0.00607**	**0.03**

File: PowerPlant/Regulatory - Environmental/Correspondence/WDNR
Document: 2014-10-09 (WDNR) B8 and B9 Stack Test Report Cover Letter

10/9/2014

B28 Compliance Status:

- Total particulate test results were in compliance with the applicable permit limitation of Permit No.: 436035930-P23 condition I.E.1.a.(1).
- Monthly emissions are calculated by multiplying the monthly heat input to the boiler by a PM_{10} emission factor of 0.021 lb/mmBtu and a $PM_{2.5}$ emission factor of 0.0143 lb/mmBtu, or the emission factor from the most recent compliance emission tests, whichever is greater per Permit No.: 11-DMM-326 condition E.1.b.(8)(a). The PM_{10} and $PM_{2.5}$ emission rates were not determined with the test method used. However, the total PM emission rate of 0.00878 lb/mmBtu is less than the PM_{10} and $PM_{2.5}$ emission factors; therefore we will continue to use the higher values in the calculation of PM_{10} and $PM_{2.5}$ mass emissions.

B09 Compliance Status:

- Total particulate test results were in compliance with the applicable permit limitation of Permit No.: 436035930-P23 condition I.D.1.a.(1).
- Monthly emissions are calculated by multiplying the monthly heat input to the boiler by a PM_{10} emission factor of 0.012 lb/mmBtu and a $PM_{2.5}$ emission factor of 0.0107 lb/mmBtu, or the emission factor from the most recent compliance emission tests, whichever is greater per Permit No.: 11-DMM-326 condition D.2.b.(5)(a). The PM_{10} and $PM_{2.5}$ emission rates were not determined with the test method used. However, the total PM emission rate of 0.00607 lb/mmBtu is less than the PM_{10} and $PM_{2.5}$ emission factors; therefore we will continue to use the higher values in the calculation of PM_{10} and $PM_{2.5}$ mass emissions.

If you have any questions regarding the stack test report, or require additional information, please contact me.

Sincerely,

Thomas E. Reed, P.E.
Environmental Engineer
Manitowoc Public Utilities
Phone: 920-686-4384
Cell: 920-973-7134
Fax: 920-686-4348

Cc: Nilaksh Kothari – MPU
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Scott Karbon – MPU
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File: PowerPlant/Regulatory - Environmental/Correspondence/WDNR
Document: 2014-10-09 (WDNR) B8 and B9 Stack Test Report Cover Letter

10/9/2014

Report on the
Air Emissions Test Program

Conducted for Manitowoc Public Utilities
At the Manitowoc Public Utilities Power Plant
Located in Manitowoc, Wisconsin

Report No. 4784C
October 7, 2014

Table of Contents

Project Overview

General

Airtech Environmental Services, Inc. (Airtech) was contracted by Manitowoc Public Utilities (MPU) to perform an air emissions test program at their facility located in Manitowoc, Wisconsin. The specific objective of this test program was to perform compliance testing to determine the concentrations of total filterable particulate matter (PM), and condensable particulate matter (CPM) from the exhausts of two (2), circulating, fluidized-bed boilers designated as Boiler 8 (B28) and Boiler 9 (B09).

Testing was performed to meet the requirements of MPU, the Wisconsin Department of Natural Resources (WDNR) and the United States Environmental Protection Agency (US EPA), as applicable.

Testing was performed on September 9 and September 10, 2014. Coordinating the field portion of the test program were:

Thomas Reed – Manitowoc Public Utilities
Adam Becker– Manitowoc Public Utilities
Riley Kloss – Airtech Environmental Services Inc.

Methodology

EPA Method 5 combined with EPA Method 202 was used to determine the PM and CPM concentrations at each test location. The total PM concentration was defined as the sum of the filterable and condensable fractions. In EPA Methods 5/202, a sample of the gas stream was withdrawn isokinetically from the test location. PM was collected in a Teflon probe and on a glass fiber filter. CPM passed through the probe and filter and collected in a dry impinger system. Results are expressed in units of grains per dry standard cubic foot (gr/dscf) and pounds per hour (lb/hr). Analysis for filterable PM and CPM was conducted at the Airtech laboratory located in Elk Grove Village, Illinois.

To convert the concentrations of particulate to mass emission rates, the volumetric flow rate was determined concurrently with each test run using EPA Methods 1, 2, 3 and 4.

Parameters

The following specific parameters were determined at each test location:

- gas temperature
- gas velocity
- carbon dioxide content
- oxygen content
- moisture content
- particulate matter concentration
- condensable particulate matter

Results

A summary of test results is presented in Tables 1 and 2 on Pages 4 and 5.

Proximate and ultimate fuel analysis was conducted on all fuels used during the test program. An F_c factor was calculated based on the mass percentage of each fuel in the final fuel feed. The F_c factor used in the final emission calculation was 1,559 scf/mmBtu for Boiler B28 and 1,712 scf/mmBtu for Boiler B09. The results of the fuel analysis can be found in the Laboratory Data section of the Appendix. A summary of the resulting F_c factor can be found in the Parameters section of the Appendix.

Submitted by:	Reviewed by:
Cathy Busse, Technical Writer	Michael Hess, CEMS Manager

Summary of Results

Table 1 – Summary of Boiler B28 PM Results

Test Parameters	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	9/9/2014	9/9/2014	9/9/2014	
Start Time	8:00	10:45	13:20	
Stop Time	10:18	12:57	15:31	
Gas Conditions				
Temperature (^{o}F)	286	290	293	**290**
Volumetric Flow Rate (acfm)	131,500	129,300	130,200	**130,300**
Volumetric Flow Rate (scfm)	87,400	85,400	85,700	**86,200**
Volumetric Flow Rate (dscfm)	79,300	77,600	77,500	**78,100**
Carbon Dioxide (% dry)	12.3	12.3	12.1	**12.2**
Oxygen (% dry)	6.5	6.7	6.9	**6.7**
Moisture (%)	9.37	9.27	9.60	**9.41**
Filterable PM Results				
Concentration (grains/dscf)	0.00137	0.00119	0.00110	**0.00122**
Emission Rate, Fc (lb/mmBtu)	0.00248	0.00216	0.00203	**0.00222**
Emission Rate (lb/hr)	0.932	0.791	0.732	**0.819**
Condensible PM Results				
Concentration (grains/dscf)	0.00326	0.00361	0.00390	**0.00359**
Emission Rate, Fc (lb/mmBtu)	0.00589	0.00656	0.00721	**0.00655**
Emission Rate (lb/hr)	2.22	2.40	2.59	**2.40**
Total PM Results				
Concentration (grains/dscf)	0.00463	0.00480	0.00500	**0.00481**
Emission Rate, Fc (lb/mmBtu)	0.00837	0.00872	0.00924	**0.00878**
Emission Rate (lb/hr)	3.15	3.19	3.33	**3.22**

Table 2 – Summary of Boiler B09 PM Results

Test Parameters	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	9/10/2014	9/10/2014	9/10/2014	
Start Time	7:46	10:38	13:25	
Stop Time	10:00	12:52	15:35	
Gas Conditions				
Temperature (^{o}F)	342	338	337	**339**
Volumetric Flow Rate (acfm)	227,100	225,000	226,500	**226,200**
Volumetric Flow Rate (scfm)	145,100	144,400	145,600	**145,040**
Volumetric Flow Rate (dscfm)	132,600	132,600	132,300	**132,500**
Carbon Dioxide (% dry)	12.1	13.6	12.2	**12.7**
Oxygen (% dry)	7.0	5.1	6.8	**6.3**
Moisture (%)	8.67	8.22	9.19	**8.69**
Filterable PM Results				
Concentration (grains/dscf)	0.00281	0.00117	0.000650	**0.00154**
Emission Rate, Fc (lb/mmBtu)	0.00568	0.00210	0.00130	**0.00303**
Emission Rate (lb/hr)	3.19	1.33	0.737	**1.75**
Condensible PM Results				
Concentration (grains/dscf)	0.000829	0.00180	0.00212	**0.00158**
Emission Rate, Fc (lb/mmBtu)	0.00168	0.00323	0.00423	**0.00305**
Emission Rate (lb/hr)	0.942	2.05	2.40	**1.80**
Total PM Results				
Concentration (grains/dscf)	0.00364	0.00297	0.00277	**0.00313**
Emission Rate, Fc (lb/mmBtu)	0.00736	0.00533	0.00553	**0.00607**
Emission Rate (lb/hr)	4.14	3.38	3.14	**3.55**

Test Procedures

Method Listing

The test methods found in 40 CFR Part 60, Appendix A and 40 CFR Part 51, Appendix M were referenced during the test program. The following individual methods were used:

Method 1	Sample and velocity traverse for stationary sources
Method 2	Determination of stack gas velocity and volumetric flow rate (type S pitot tube)
Method 3	Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources
Method 4	Determination of moisture content in stack gases
Method 5	Determination of particulate matter emissions from stationary sources
Method 19	Determination of sulfur dioxide, nitrogen oxide and carbon monoxide emission rates
Method 202	Dry impinger method for determining condensable particulate emissions from stationary sources

Method Descriptions

Method 1

Method 1 was used to determine the suitability of each test location and to determine the sample points used for the pollutant concentration determinations. Each test location conformed to the minimum requirements of being located at least 2.0 diameters downstream and at least 0.5 diameters upstream from the nearest flow disturbance.

The Boiler 8 test location was a rectangular, vertical duct with dimensions of 124.75 inches by 60.0 inches. Five points were sampled for each of the five test ports. The test ports were located approximately 4.4 equivalent diameters downstream and approximately 8.9 equivalent diameters upstream from the nearest flow disturbances. A cross section of the sampling location, showing the sample points, can be found in Figure 1 of the Appendix.

The Boiler 9 test location was a round, vertical stack with a diameter of 108 inches. Twelve points were sampled for each of the two test ports. The test ports were located approximately 3.3 diameters downstream and approximately 2.0 diameters upstream from the nearest flow disturbances. A cross section of the sampling location, showing the sample points, can be found in Figure 2 of the Appendix.

Method 2

Method 2 was used to determine the gas velocity through each test location. A Type S pitot tube and an incline plane oil manometer were used at each test location for the determination of gas velocity. A diagram of the Method 2 apparatus is shown as a component of the Method 5/202 sampling apparatus in Figure 3 and 4 of the Appendix.

The manometer was leveled and "zeroed" prior to each test run. The sample train was leak checked before and after each run by pressurizing the positive side, or "high" side, of the pitot tube and creating a deflection on the manometer of at least three inches H_2O. The leak check was considered valid if the manometer remained stable for 15 seconds. This procedure was repeated on the negative side by generating a vacuum of at least three inches H_2O. The velocity head pressure and gas temperature were then determined at each point specified in Method 1. The static pressure of the duct was measured using a water filled U-tube manometer. In addition, the barometric pressure was measured and recorded.

Method 3

The carbon dioxide and oxygen contents were determined at the test location using EPA Method 3. A gas sample was collected into a Tedlar bag from the dry gas meter exhaust of the Method 5/202 sampling trains for the duration of each test run. Analysis was performed using an Orsat gas analyzer.

The gas analyzer was leak checked prior to analysis by raising the liquid levels in each pipette to a reference mark on the capillary tubes and then closing the pipette valves. The burette solution was then raised to bring the meniscus onto the graduated portion of the burette and the manifold valve was closed. After four minutes, the pipette meniscus did not fall below the reference mark and the burette meniscus did not fall by more than 0.2 percent, so the leak check was considered valid. The average of three gas analyses determined the carbon dioxide and oxygen contents.

The carbon dioxide content and oxygen content were used, along with the moisture content determined in Method 4 to calculate the gas stream molecular weight. The molecular weight was then used for the volumetric flow rate calculations. For these calculations, the balance of the gas stream was assumed to consist of nitrogen since other gas stream components are insignificant for the purposes of calculating molecular weight.

Method 4

The moisture content at each test location was determined using Method 4. A known volume of sample gas was withdrawn from the source and the moisture was condensed and measured. The dry standard volume of the sample gas was then compared to the volume of moisture collected to determine the moisture content of the sample gas. A diagram of the Method 4 apparatus is shown as part of the Method 5/202 sampling apparatus in Figure 3 of the Appendix.

To condense the water vapor, the gas sample passed through a series of four impingers. The impingers were charged as outlined in Method 5/202. The sample train was leak checked prior to the test run by capping the probe tip and pulling a vacuum of at least 15 inches Hg. The sample train was leak checked prior to the test run by capping the probe tip and pulling a vacuum higher than the value expected during the run. A leak check was considered valid if the leak rate was less than 0.02 cubic feet per minute.

The volume of dry gas exiting the gas condenser system was measured with a dry gas meter. After leaving the dry gas meter, the sample stream passed through an orifice used to meter the flow rate through the sample train. The pressure drop across the orifice was measured with an incline plane, oil manometer. The gas meter reading, gas meter inlet and outlet temperatures, pressure drop and pump vacuum were recorded every 5 minutes.

After the test run, the sample train was leak checked at a value greater than or equal to the highest value encountered during the run. The amount of water collected in the condenser system was measured volumetrically and the silica gel measured gravimetrically. The net gain of water was converted to a volume of wet gas and then compared to the amount of dry gas sampled to determine the moisture content.

Method 5/202

The PM and CPM concentrations were determined at each test location using Method 5/202. In Method 5/202, a sample of the gas stream was withdrawn isokinetically from the test location. PM was collected in the nozzle, probe, connecting glassware and filter. CPM in the sample gas passed through the filter and collected in a gas condenser system.

To prevent contamination, all components of the sample trains were constructed of glass or Teflon with no metal connections. Prior to testing all the components of the Method 5 sampling train were cleaned using detergent and then rinsed with tap water, deionized water and lastly with acetone. For the Method 202 sampling train all the components were cleaned using detergent and then rinsed with tap water, deionized water, acetone and lastly with hexane. After drying, all components were sealed with parafilm or Teflon tape.

The Method 5 portion of the sampling train consisted of a glass nozzle, a Teflon lined sample probe and a glass fiber filter. The probe and filter were maintained at a temperature of 248^{o}F (+/- 25^{o}F) to prevent the condensation of moisture. Sample gas passed through the nozzle, the heated probe and then through the heated filter.

After exiting the Method 5 portion of the sampling system, the sample gas passed through an EPA Method 23 type glass coil condenser and then through a series of four (4) glass impingers. The condenser was cooled with a water recirculation pump that was placed in a water bath. The recirculation pump and coiled condenser were then used to maintain the gas temperature between 65^{o}F and 85^{o}F at the exit of the CPM filter. Impingers 1 and 2 were initially empty. A Teflon fiber CPM filter followed impinger 2. Impinger 3 contained 100ml of water. The fourth impinger contained a known mass of silica gel to

absorb any remaining water vapor. The dry gas exiting the moisture condenser system then passed through a sample pump and a dry gas meter to measure the gas volume. After leaving the dry gas meter the sample stream passed through an orifice which was used to meter the flow rate through the sample train. The pressure drop across the orifice was measured with an incline plane oil manometer. The Method 5/202 sample train is shown in Figure 3 of the appendix.

Whatman 934-AH glass fiber filters were used as the substrate for the PM sampling. The filter was loaded into a glass filter holder with a Teflon support screen that was cleaned and prepared in the same manner as the other components of the Method 5 sample train. Prior to the test run, the filter was desiccated for at least 24 hours and then weighed to the nearest 0.0001gram (g) until a constant weight was achieved. The weight of the filter was considered to be constant when two consecutive weights taken at least six hours apart were within 0.0005g of each other.

The probe liner was thoroughly pre-cleaned with acetone and the probe wash was saved as a quality assurance check. The sample train was leak checked prior to the test run by capping the probe tip and pulling a vacuum of at least 15 inches Hg. A leak test was considered valid if the leak rate was below 0.02 cfm. When not in operation or inside the stack, the nozzle was sealed with Teflon tape.

The probe tip was then placed at the first of the sample points determined in Method 1. The velocity at the sample point was determined using Method 2 by reading the velocity pressure from the oil manometer. Sample was withdrawn from the source at a rate such that the velocity in the nozzle matched the velocity of the stack gas at the sample point (isokinetically). During the test run the train was moved to each of the Method 1 sample points. The sample time at each point was calculated based on the number of sample points and the run time. The gas velocity pressure, gas meter reading, gas meter inlet and outlet temperatures, gas meter orifice pressure and pump vacuum was recorded for each sample point.

After the test run the sample train was leak checked at the highest vacuum encountered during the test run. The sampling train was then moved to the on-site lab and purged with zero grade nitrogen at a nominal flow rate of at least 14 liters per minute for a period of 60 minutes. Prior to the purge a known volume of degassed water was added to the impingers. The nozzle, probe and front half of the filter holder were washed with acetone and the rinse saved in a 250ml glass jar equipped with a Teflon lid. The glass fiber filter was removed from the filter holder, transferred to a Petri dish and sealed.

Upon completion of the purge, the contents of impingers one and two were transferred to a pre-cleaned 950 ml sample jar equipped with a Teflon lid. The condenser coil and all connecting glassware up to and including the front half of the CPM filter were rinsed twice with deionized ultra filtered (DUIF) water and added to the sample jar. An acetone rinse of the above glassware was performed and saved in a separate pre-cleaned 500ml sample jar equipped with a Teflon lid. Finally, two (2) rinses of the above components

were performed with hexane and added to the acetone container. The CPM filter was removed from the filter holder and placed in a 20ml glass jar.

Analysis of all sample fractions was performed at the Airtech laboratory located in Elk Grove Village, Illinois. The acetone rinses from the Method 5 portion of the sampling train were transferred to tared beakers, evaporated to dryness under ambient temperature and pressure conditions, desiccated for 24 hours and weighed to a constant weight. A weight was considered constant when the difference between two consecutive weights, taken a minimum of six hours apart, was less than or equal to 0.0005 grams. The weight gain of the glassware rinses and glass fiber filter yielded the total weight of filterable particulate collected during sampling.

Inorganic extraction of the CPM filter was performed by placing the filter into an extraction tube with DIUF water and placing it into a sonication bath for a minimum of 2 minutes. This extraction was done a total of 3 times and the water used each time was added to the impinger water container. After inorganic extraction of the CPM filter, an organic extraction of the impinger water was performed. The entire contents of the impinger water sample fraction was placed in a separatory funnel. A 30 ml aliquot of Hexane was added to the funnel and the funnel contents were thoroughly mixed. The organic layer was then allowed to separate from the water and was decanted from the funnel into the acetone and hexane sample jar. This procedure was conducted three (3) times to complete the extraction.

The inorganic contents of the separatory funnel were then transferred into a beaker and evaporated down to not less than 10 ml final volume at an elevated temperature. The remaining liquid was evaporated to dryness at ambient temperature. The beaker was desiccated for 24 hours and then weighed to a constant weight. Organic CPM extraction of the filter was performed by placing the inorganic extracted filter into an extraction tube with hexane and placing it into a sonication bath for a minimum of 2 minutes. This extraction was done a total of 3 times and the hexane used was added to the acetone/hexane container. The contents of this container was transferred into a beaker and evaporated to not less than 10 ml. The remaining fraction was then evaporated to dryness at ambient temperature and pressure. The beaker was desiccated for 24 hours and then weighed to a constant weight.

The weight differences for the organic and inorganic fractions were combined to determine the total condensible particulate collected. All fractions of the CPM analysis were adjusted for the appropriate field proof blank values.

Method 19

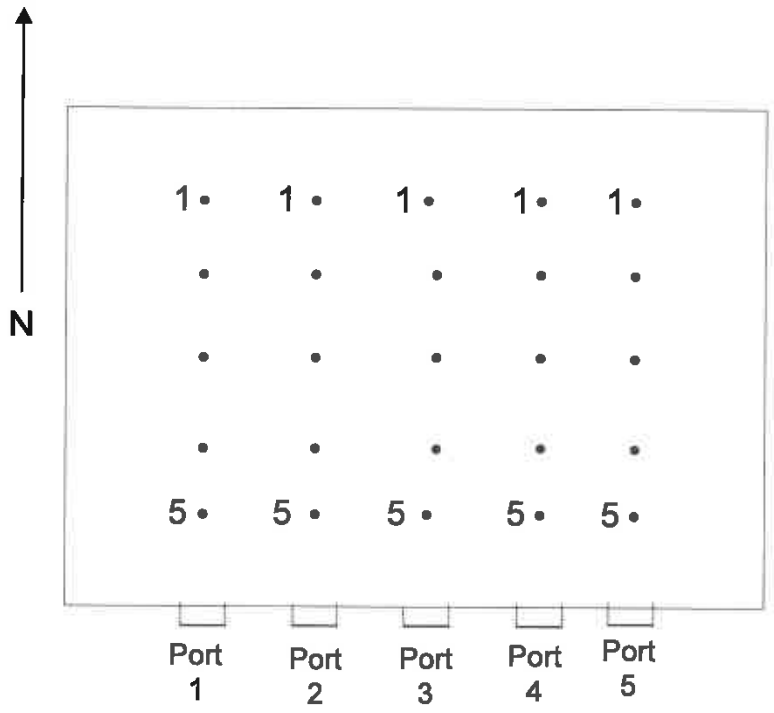
The equations in EPA Method 19 were used to calculate the emission rates of various pollutants from the test location in units of pounds per million British thermal units (lbs/mmBtu). The calculation was based on the carbon dioxide content of the sample gas and an appropriate F factor, which is the ratio of combustion gas volumes to heat inputs.

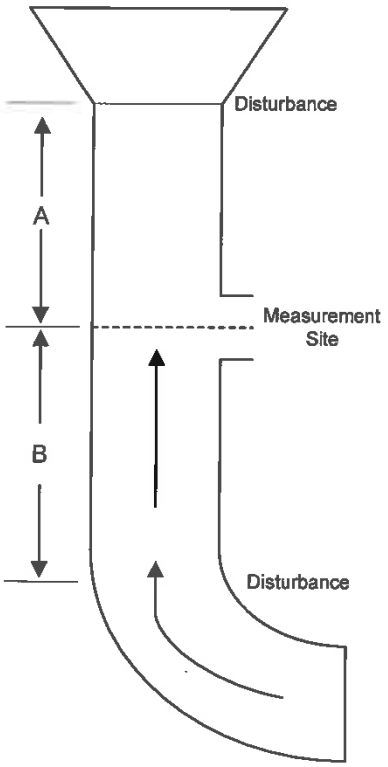
Description of Installation

Manitowoc Public Utilities (MPU) is an electric cogenerating facility located in the city of Manitowoc Wisconsin. This plant includes two atmospheric pressure, circulating fluidized bed (CFB) boilers, designated as Boilers 8 (B28) and 9 (B09). Boiler 8 was installed in 1990, and is permitted to fire coal, petroleum coke, paper pellets, biomass, rubber waste derived fuels, natural gas, or other alternative fuels as approved by the Department. The Foster Wheeler Fluidized Bed Boiler is rated at 200,000 lbs. of superheated steam per hour at 975 psig and 905 degrees F. It is equipped with an economizer and air preheater and exhausts through a baghouse. Boiler 9 (B09) was installed in 2004, and is permitted to fire coal, petroleum coke, renewable biomass and natural gas (start-up and load stabilization.) The Kvaerner/Mesto Fluidized Bed Boiler is rated at 475,000 lbs. of superheated steam per hour at 1,500 psig and 1,000 degrees F. It is equipped with an air preheater and exhausts through a baghouse.

Appendix

Figures





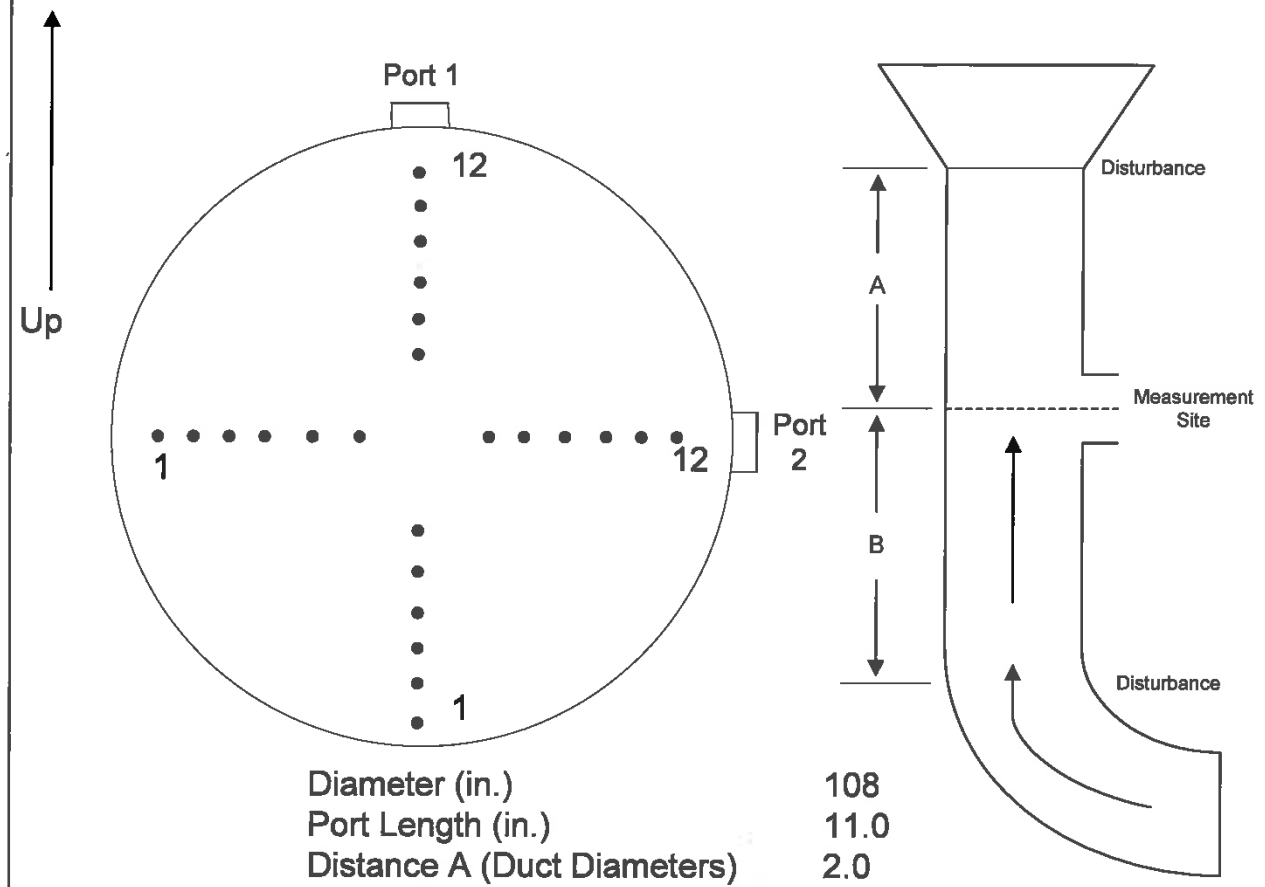
Dimensions (in.)	124.75 X 60.0
Port Length (in.)	12.0
Distance A (Duct Diameters)	8.9
Distance B (Duct Diameters)	4.4

Point	Distance From Wall (in.)
1	12.5
2	37.4
3	62.4
4	87.3
5	112.3

Cross Section of the Boiler 8 (B28) Test Location
Manitowoc Public Utilities

Figure 1

AIRTECH Environmental Services Inc.



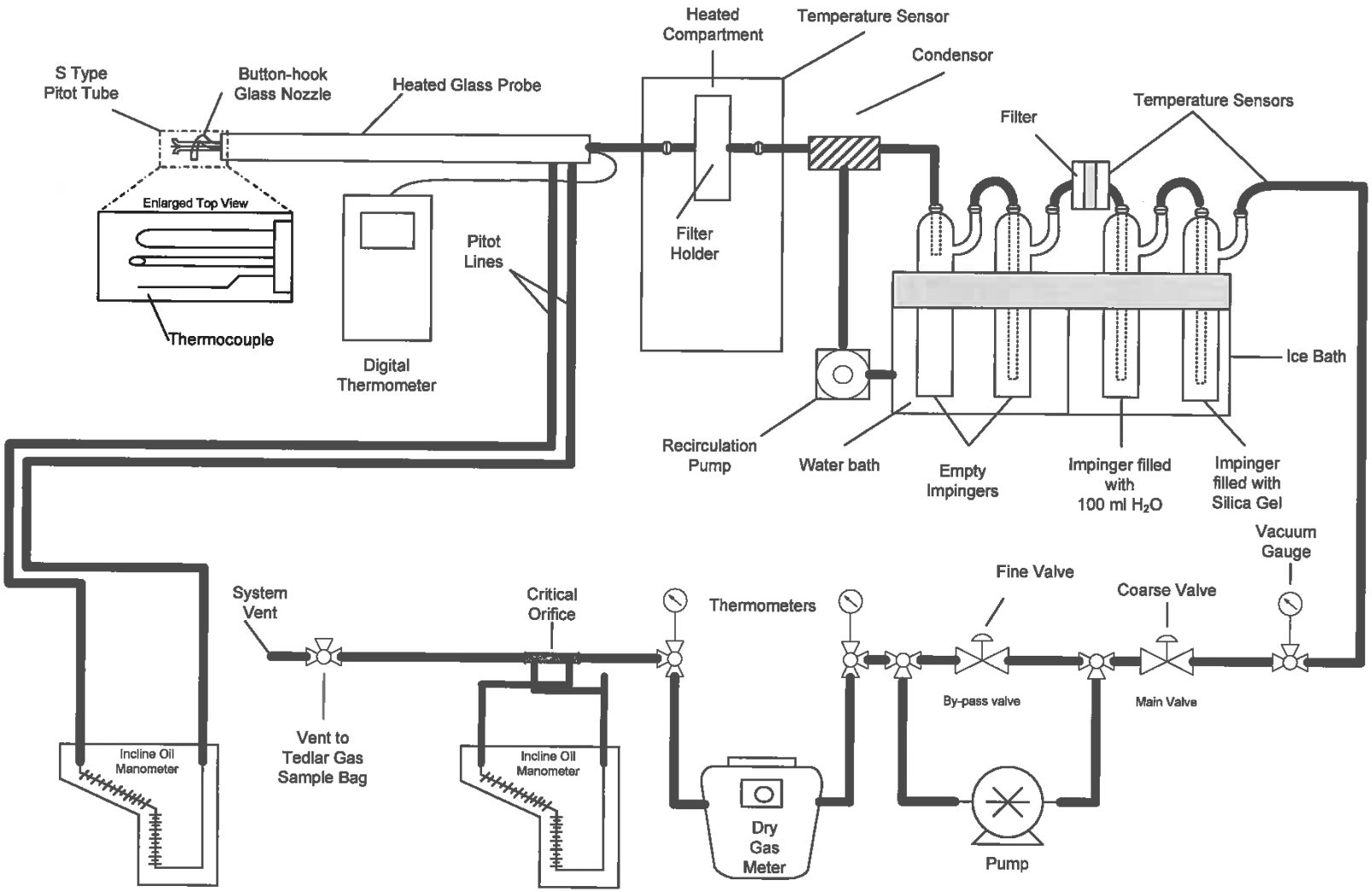
Diameter (in.)	108
Port Length (in.)	11.0
Distance A (Duct Diameters)	2.0
Distance B (Duct Diameters)	3.3

Point	Distance From Wall (in.)
1	2.3
2	7.2
3	12.8
4	19.1
5	27.0
6	38.4
7	69.6
8	81.0
9	88.9
10	95.2
11	100.8
12	105.7

Cross Section of the Boiler 9 (B9) Test Location
Manitowoc Public Utilities

Figure 2

AIRTECH Environmental Services Inc.



EPA Methods 2, 4, 5 and 202:
Total Particulate Sampling Train

Figure 3

AIRTECH
Environmental
Services Inc.

MPU04336

Sample Calculations

Sample Calculations, Boiler 28, Run 1

Area of Sample Location

$$A_s = \frac{l}{12} \times \frac{w}{12}$$

$$A_s = \frac{124.75}{12} \times \frac{60}{12}$$

$$A_s = 52.0\, ft^2$$

where:

A_s	= area of sample location (ft^2)
d_s	= diameter of sample location (in)
12	= conversion factor (in/ft)
2	= conversion factor (diameter to radius)

Stack Pressure Absolute

$$P_a = P_b + \frac{P_s}{13.6}$$

$$P_a = 29.34 + \frac{-16.6}{13.6}$$

$$P_a = 28.12 in.Hg$$

where:

P_a	= stack pressure absolute (in. Hg)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure (in. H_2O)
13.6	= conversion factor (in. H_2O/in. Hg)

Volume of Dry Gas Collected Corrected to Standard Temperature and Pressure

$$V_{m(std)} = \frac{17.64(V_m)(Y_d)\left(P_b + \frac{\Delta H}{13.6}\right)}{(T_m + 460)}$$

$$V_{m(std)} = \frac{17.64(68.13)(1.0031)\left(29.34 + \frac{1.05}{13.6}\right)}{(75.3 + 460)}$$

$$V_{m(std)} = 66.25 scf$$

where:

$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
V_m	= volume of gas sampled at meter conditions (ft^3)
Y_d	= gas meter correction factor (dimensionless)
P_b	= barometric pressure (in. Hg)
ΔH	= average sample pressure (in. H_2O)
T_m	= average gas meter temperature (^oF)
13.6	= conversion factor (in. H_2O/in. Hg)
17.64	= ratio of standard temperature over standard pressure (^oR/in. Hg)
460	= conversion (^oF to ^oR)

Volume of Water Vapor Collected Corrected to Standard Temperature and Pressure

$$V_{w(std)} = 0.04715 \times (V_{wc} + V_{wsg})$$

$$V_{w(std)} = 0.04715 \times (124.8 + 20.5)$$

$$V_{w(std)} = 6.85 scf$$

where:

$V_{w(std)}$	= volume of water vapor at standard conditions (scf)
V_{wc}	= weight of liquid collected (g)
V_{wsg}	= weight gain of silica gel (g)
0.04715	= volume occupied by one gram of water at standard temperature and pressure (ft^3/g)

Percent Moisture[1]

$$B_{ws} = 100 \times \left[\frac{V_{w(std)}}{\left(V_{m(std)} + V_{w(std)}\right)} \right]$$

$$B_{ws} = 100 \times \left[\frac{6.85}{(66.25 + 6.85)} \right]$$

$$B_{ws} = 9.37\%$$

where:

B_{ws}	= moisture content of the gas stream (%)
$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
$V_{w(std)}$	= volume of water vapor at standard conditions (scf)
100	= conversion factor

Molecular Weight of Dry Gas Stream[2]

$$M_d = \left(44 \times \frac{\%CO_2}{100}\right) + \left(32 \times \frac{\%O_2}{100}\right) + \left(28 \times \frac{(\%N_2)}{100}\right)$$

$$M_d = \left(44 \times \frac{12.3}{100}\right) + \left(32 \times \frac{6.5}{100}\right) + \left(28 \times \frac{(81.2)}{100}\right)$$

$$M_d = 30.23 lb / lbmole$$

where:

M_d	= molecular weight of the dry gas stream (lb/lb-mole)
$\%CO_2$	= carbon dioxide content of the dry gas stream (%)
44	= molecular weight of carbon dioxide (lb/lb-mole)
$\%O_2$	= oxygen content of the dry gas stream (%)
32	= molecular weight of oxygen (lb/lb-mole)
$\%N_2$	= nitrogen content of the dry gas stream (%)
28	= molecular weight of nitrogen and carbon monoxide (lb/lb-mole)
100	= conversion factor

[1] The moisture saturation point is used for all calculations if it is exceeded by the actual moisture content.
[2] The remainder of the gas stream after subtracting carbon dioxide and oxygen is assumed to be nitrogen.

Molecular Weight of Wet Gas Stream

$$M_s = \left(M_d \times \left(1 - \frac{B_{ws}}{100}\right)\right) + \left(18 \times \frac{B_{ws}}{100}\right)$$

$$M_s = \left(30.23 \times \left(1 - \frac{9.37}{100}\right)\right) + \left(18 \times \frac{9.37}{100}\right)$$

$$M_s = 29.09 lb / lbmole$$

where:

M_s	= molecular weight of the wet gas stream (lb/lb-mole)
M_d	= molecular weight of the dry gas stream (lb/lb-mole)
B_{ws}	= moisture content of the gas stream (%)
18	= molecular weight of water (lb/lb-mole)
100	= conversion factor

Velocity of Gas Stream

$$V_s = 85.49 (C_p) \left(\sqrt{\overline{\Delta P}}\right) \sqrt{\frac{(T_s + 460)}{(M_s)\left(P_b + \frac{P_s}{13.6}\right)}}$$

$$V_s = 85.49 (0.84)(0.615) \sqrt{\frac{(286 + 460)}{(29.09)\left(29.34 + \frac{-16.6}{13.6}\right)}}$$

$$V_s = 42.2 ft / \sec$$

where:

V_s	= average velocity of the gas stream (ft/sec)
C_p	= pitot tube coefficient dimensionless
$\sqrt{\Delta P}$	= average square root of velocity pressures (in. H_2O)$^{1/2}$
T_s	= average stack temperature (^oF)
M_s	= molecular weight of the wet gas stream (lb/lb-mole)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure of gas stream (in. H_2O)
85.49	= pitot tube constant (ft/sec)([(lb/lb-mole)(in. Hg)]/[(^{0}R)(in. H_2O)]) $^{1/2}$
460	= conversion (^oF to ^oR)
13.6	= conversion factor (in. H_2O/in. Hg)

Volumetric Flow of Gas Stream - Actual Conditions

$$Q_a = 60(V_s)(A_s)$$

$$Q_a = 60(42.2)(52.0)$$

$$Q_a = 131{,}509 acfm$$

where:

Q_a	= volumetric flow rate of the gas stream at actual conditions (acfm)
V_s	= average velocity of the gas stream (ft/sec)
A_s	= area of duct or stack (ft^2)
60	= conversion factor (min/hr)

Volumetric Flow of Gas Stream - Standard Conditions

$$Q_{std} = \frac{17.64(Q_a)\left(P_b + \frac{P_s}{13.6}\right)}{(T_s + 460)}$$

$$Q_{std} = \frac{17.64(131{,}509)\left(29.34 + \frac{-16.6}{13.6}\right)}{(286 + 460)}$$

$$Q_{std} = 87{,}428 scfm$$

where:

Q_{std}	= volumetric flow rate of the gas stream at standard conditions (scfm)
Q_a	= volumetric flow rate of the gas stream at actual conditions (acfm)
T_s	= average stack temperature (^oF)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure of gas stream (in. H_2O)
13.6	= conversion factor (in. H_2O/in. Hg)
17.64	= ratio of standard temperature over standard pressure (^oR/in. Hg)
460	= conversion (^oF to ^oR)

Volumetric Flow of Gas Stream - Standard Conditions - Dry Basis

$$Q_{dstd} = Q_{std}\left(1 - \frac{B_{ws}}{100}\right)$$

$$Q_{dstd} = 87{,}428\left(1 - \frac{9.37}{100}\right)$$

$$Q_{dstd} = 79{,}226 dscfm$$

where:

Q_{dstd}	= volumetric flow rate of the gas stream at standard conditions, on a dry basis (dscfm)
Q_{std}	= volumetric flow rate of the gas stream at standard conditions (scfm)
B_{ws}	= moisture content of the gas stream (%)
100	= conversion factor

Area of Nozzle

$$A_n = \pi \times \left(\frac{d_n}{2 \times 12}\right)^2$$

$$A_n = \pi \times \left(\frac{0.253}{2 \times 12}\right)^2$$

$$A_n = 0.000349\, ft^2$$

where:

A_n	= area of nozzle (ft^2)
d_n	= diameter of nozzle (in)
12	= conversion factor (in/ft)
2	= conversion factor (diameter to radius)

Percent Isokinetic

$$I = \frac{0.0945(T_s + 460)(V_{m(std)})}{\left(P_b + \frac{P_s}{13.6}\right)(v_s)(A_n)(\Theta)\left(1 - \frac{B_{ws}}{100}\right)}$$

$$I = \frac{0.0945(286 + 460)(66.25)}{\left(29.34 + \frac{-16.6}{13.6}\right)(42.2)(3.49 \times 10^{-4})(125)\left(1 - \frac{9.37}{100}\right)}$$

$$I = 99.6\%$$

where:

I	= percent isokinetic (%)
T_s	= average stack temperature (^oF)
$V_{m(std)}$	= volume of gas collected at standard temperature and pressure (scf)
P_b	= barometric pressure (in. Hg)
P_s	= static pressure of gas stream (in. H_2O)
V_s	= average velocity of the gas stream (ft/sec)
A_n	= cross sectional area of nozzle (ft^2)
Θ	= sample time (min)
B_{ws}	= moisture content of the gas stream (%)
0.0945	= constant (^0R/in. Hg)
460	= conversion (^oF to ^oR)
13.6	= conversion factor (in. H_2O/in Hg)
100	= conversion factor

Acetone Wash Blank Correction[3]

$$W_a = \frac{(m_{ab})(v_{aw})}{v_{awb}}$$

$$W_a = \frac{(0.0001)(86)}{144}$$

$$W_a = 0.0001g$$

where:

W_a	= wash blank correction (g)
m_{ab}	= mass of particulate in acetone wash blank (g)
v_{aw}	= volume of acetone wash (g)
v_{awb}	= volume of acetone wash blank (g)

Mass in Front Half, Acetone Blank Corrected

$$m_f = m_{fil} + (m_a - W_a)$$

$$m_f = 0.0000 + (0.0060 - 0.0001)$$

$$m_f = 0.0059g$$

where:

m_f	= mass in front half filter, and acetone wash, blank corrected (g)
m_{fil}	= mass in front half filter (g)
m_a	= mass in acetone wash (g)
W_a	= particulate mass in acetone wash blank (g)

[3] Blank corrections for all particulate matter are performed in the same manner.

Total Particulate Catch

$$M_n = m_f + m_b$$
$$M_n = 0.0059 + 0.0140$$
$$M_n = 0.0199g$$

where:

M_n	= total mass catch (g)
m_f	= mass in front half filter, and acetone wash, blank corrected (g)
m_b	= mass in back half organic fraction, and inorganic fraction, blank corrected (g)

PM Concentration, grains/dscf

$$C_{gr/dscf} = \frac{(M_n)(15.43)}{V_{m,std}}$$
$$C_{gr/dscf} = \frac{(0.0199)(15.43)}{66.25}$$
$$C_{gr/dscf} = 0.00463 grains/dscf$$

where:

$C_{gr/dscf}$	= particulate concentration (grains/dscf)
M_n	= total particulate catch (g)
$V_{m(std)}$	= volume of gas collected at standard conditions (scf)
15.43	= conversion factor (grains/g)

PM Emission Rate, lb/mmBtu[4]

$$E_{lb/mmBtu} = \frac{(M_n)(F_c)(100)}{(V_{m(std)})(453.6)(CO_2)}$$

$$E_{lb/mmBtu} = \frac{(0.0199)(1{,}559)(100)}{(66.25)(453.6)(12.3)}$$

$$E_{lb/mmBtu} = 0.00837 lb/mmBtu$$

where:

$E_{lb/mmBtu}$	= particulate emission rate (lb/mmBtu)
M_n	= total particulate catch (g)
Fc	= carbon dioxide based fuel factor for natural gas (scf.mmBtu)
100	= conversion factor (%)
453.6	= conversion factor (g/lb)
CO_2	= carbon dioxide concentration in sample gas (%)

PM Emission Rate, lb/hr

$$E_{lb/hr} = \frac{(M_n)(Q_{dstd})(60)}{(V_{m(std)})(453.6)}$$

$$E_{lb/hr} = \frac{(0.0199)(79{,}266)(60)}{(66.25)(453.6)}$$

$$E_{lb/hr} = 3.15 lb/hr$$

where:

$E_{lb/hr}$	= particulate emission rate (lb/hr)
M_n	= total particulate catch (g)
$V_{m(std)}$	= volume of gas collected at standard conditions (scf)
Q_{dstd}	= volumetric flow rate of the dry gas stream at standard conditions (dscfm)
60	= conversion factor (min/hr)
453.6	= conversion factor (g/lb)

[4] All lb/mmBtu emission rates were calculated in a similar manner.

Parameters

MPU

Method 5/202 Parameters
Boiler 8

Project No. 4784

EPA Methods 1-5 Parameters	Run 1	Run 2	Run 3
Date	9/9/2014	9/9/2014	9/9/2014
Start Time	8:00	10:45	13:20
Stop Time	10:18	12:57	15:31
Dimensions of Sample Location, D_s (in)	124.75 X 60	124.75 X 60	124.75 X 60
Velocity Pressure, $\Delta P^{1/2}$ avg (in. $H_2O^{1/2}$)	0.615	0.603	0.605
Barometric Pressure, P_b (Inches Hg)	29.34	29.34	29.34
Static Pressure, P_s (Inches H_2O)	-16.6	-16.6	-16.6
Pitot Coefficient, C_p	0.84	0.84	0.84
Sample Location Temperature, T_s (^oF)	286	290	293
Volume Metered, V_m (ft^3)	68.13	67.13	67.44
Meter Temperature, T_m (^oF)	75.3	74.7	74.9
Average Sample Pressure, ΔH_{avg} (in. H_2O)	1.05	0.989	1.00
Gas Meter Correction Factor, Y_d	1.0031	1.0031	1.0031
Carbon Dioxide (% dry)	12.3	12.3	12.1
Oxygen (% dry)	6.5	6.7	6.9
Weight of Water Collected, V_{wc} (g)	124.8	118.3	132.0
Silica Gel Net Weight, V_{wsg} (g)	20.5	23.3	15.8
Diameter of Nozzle, D_n (in)	0.253	0.253	0.253
Run Time, θ (minutes)	125	125	125
EPA METHODS 1-5 RESULTS			
Area of Sample Location, A_s (ft^2)	52.0	52.0	52.0
Stack Pressure Absolute (inches Hg)	28.12	28.12	28.12
Volume Metered Standard, $V_{m(std)}$ (ft^3)	66.25	65.34	65.62
Volume of Water Vapor, $V_{w(std)}$ (ft^3)	6.85	6.68	6.97
Percent Moisture, B_{ws} (%)	9.37	9.27	9.60
Moisture Saturation Point, B_{wsat} (%)	100	100	100
Dry Molecular Weight, M_d (lbs/lb mole)	30.23	30.23	30.21
Wet Molecular Weight, M_s (lbs/lb mole)	29.09	29.10	29.04
Gas Velocity, V_s (ft/sec)	42.2	41.4	41.7
Average Flowrate, Q_a (acfm)	131,509	129,267	130,201
Standard Flowrate, Q_{std} (scfm)	87,428	85,443	85,741
Dry Standard Flowrate, Q_{dstd} (dscfm)	79,266	77,552	77,541
Area of Nozzle, A_n (ft^2)	0.000349	0.000349	0.000349
Isokinetics (%)	99.6	100.4	100.9
Front-Half Particulate (g)	0.0059	0.0050	0.0047
Concentration (grains/dscf)	0.00137	0.00119	0.00110
Emission Rate, Fc (lb/mmBtu)	0.00248	0.00216	0.00203
Emission Rate (lb/hr)	0.932	0.791	0.732
Condensible Particulate (g)	0.0140	0.0153	0.0166
Concentration (grains/dscf)	0.00326	0.00361	0.00390
Emission Rate, Fc (lb/mmBtu)	0.00589	0.00656	0.00721
Emission Rate (lb/hr)	2.22	2.40	2.59

MPU

Method 5/202 Parameters
Boiler 9

Project No. 4784

EPA Methods 1-5 Parameters	Run 1	Run 2	Run 3
Date	9/10/2014	9/10/2014	9/10/2014
Start Time	7:46	10:38	13:25
Stop Time	10:00	12:52	15:35
Dimensions of Sample Location, D_s (in)	108	108	108
Velocity Pressure, $\Delta P^{1/2}$ avg (in. $H_2O^{1/2}$)	0.851	0.849	0.851
Barometric Pressure, P_b (Inches Hg)	29.03	29.03	29.03
Static Pressure, P_s (Inches H_2O)	0.1	0.1	0.1
Pitot Coefficient, C_p	0.84	0.84	0.84
Sample Location Temperature, T_s (^oF)	342	338	337
Volume Metered, V_m (ft^3)	68.18	68.62	69.37
Meter Temperature, T_m (^oF)	71.4	72.0	81.7
Average Sample Pressure, ΔH_{avg} (in. H_2O)	1.05	1.04	1.06
Gas Meter Correction Factor, Y_d	1.0031	1.0031	1.0031
Carbon Dioxide (% dry)	12.1	13.6	12.2
Oxygen (% dry)	6.97	5.10	6.77
Weight of Water Collected, V_{wc} (g)	109.7	106.4	117.8
Silica Gel Net Weight, V_{wsg} (g)	23.3	19.7	23.7
Diameter of Nozzle, D_n (in)	0.220	0.220	0.220
Run Time, θ (minutes)	120	120	120
EPA METHODS 1-5 RESULTS			
Area of Sample Location, A_s (ft^2)	63.6	63.6	63.6
Stack Pressure Absolute (inches Hg)	29.04	29.04	29.04
Volume Metered Standard, $V_{m(std)}$ (ft^3)	66.08	66.43	65.95
Volume of Water Vapor, $V_{w(std)}$ (ft^3)	6.27	5.95	6.67
Percent Moisture, B_{ws} (%)	8.67	8.22	9.19
Moisture Saturation Point, B_{wsat} (%)	100	100	100
Dry Molecular Weight, M_d (lbs/lb mole)	30.21	30.39	30.23
Wet Molecular Weight, M_s (lbs/lb mole)	29.16	29.37	29.10
Gas Velocity, V_s (ft/sec)	59.5	59.0	59.3
Average Flowrate, Q_a (acfm)	227,097	225,018	226,477
Standard Flowrate, Q_{std} (scfm)	145,102	144,397	145,629
Dry Standard Flowrate, Q_{dstd} (dscfm)	132,578	132,587	132,304
Area of Nozzle, A_n (ft^2)	0.000264	0.000264	0.000264
Isokinetics (%)	100.2	100.7	100.2
Front-Half Particulate (g)	0.0120	0.0050	0.0028
Concentration (grains/dscf)	0.00281	0.00117	0.00065
Emission Rate, Fc (lb/mmBtu)	0.00568	0.00210	0.00130
Emission Rate (lb/hr)	3.19	1.33	0.737
Condensible Particulate (g)	0.0035	0.0077	0.0091
Concentration (grains/dscf)	0.000829	0.00180	0.00212
Emission Rate, Fc (lb/mmBtu)	0.00168	0.00323	0.00423
Emission Rate (lb/hr)	0.942	2.05	2.40

Fd Parameters	B8	B9
Hydrogen (%)	5.28	4.56
Carbon (%)	62.06	71.85
Sulfur (%)	2.56	3.87
Nitrogen (%)	0.83	1.27
Oxygen (%)	25.00	15.03
Heating Value (Btu/lb)	12,778	13,473

Result	Sample 2	Sample 1
Fd (dscf/mmBtu)	8,158	9,055
Fc (dscf/mmBtu)	1,559	1,712

Field Data Printouts

Project Number	4784
Client	MPU
Plant	Manitowoc, WI
Location	B-8
Date	9/9/2014
Meter ID	M-29
Y_d	1.0031
Pitot C_p	0.84

Nozzle Diameter (in)	0.253
Filter ID	30575
Train Type	IMP
Train ID	IB202-6
P_b (inches Hg)	29.34
P_s (inches H_2O)	-16.6
Start Time	8:00
Stop Time	10:18

Place an "x" in the appropriate Box

Circular?	
Rectangular?	x
Diameter	
Length	124.75
Width	60

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	697.4	583.5	113.9
Impinger 2	616.3	613.8	2.5
Impinger 3	668.3	659.9	8.4
Silica Gel	899.8	879.3	20.5
Weight of Water Collected, V_{wc} (g)			124.8
Silica Gel Net Weight, V_{wsg} (g)			20.5

Orsat	%CO_2	%CO_2+%O_2	%O_2
Trial 1	12.4	18.8	6.4
Trial 2	12.4	18.8	6.4
Trial 3	12.2	18.8	6.6
Average	12.3	NA	6.5

Run 1

Traverse Point	Min/Pt 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 197.30	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
1-1	5	0.17	0.44	199.42	284	68	65	0.412	28.2	2.093	117.1
1-2	10	0.17	0.44	201.21	285	69	65	0.412	28.3	1.765	98.9
1-3	15	0.38	0.98	203.79	285	71	68	0.616	42.2	2.536	95.0
1-4	20	0.63	1.60	207.33	285	76	68	0.794	54.4	3.468	100.9
1-5	25	0.75	1.90	211.17	285	77	68	0.866	59.4	3.762	100.3
2-1	30	0.17	0.44	214.25	285	77	69	0.412	28.3	3.003	168.2
2-2	35	0.16	0.41	216.02	284	77	69	0.400	27.4	1.726	99.6
2-3	40	0.38	0.98	218.65	286	77	69	0.616	42.3	2.568	96.3
2-4	45	0.59	1.50	222.01	285	78	70	0.768	52.6	3.279	98.6
2-5	50	0.71	1.80	225.75	286	80	71	0.843	57.8	3.642	99.9
3-1	55	0.19	0.49	228.54	288	81	71	0.436	29.9	2.706	143.6
3-2	60	0.19	0.49	230.47	287	81	71	0.436	29.9	1.872	99.3
3-3	65	0.37	0.95	233.05	285	81	72	0.608	41.7	2.503	95.0
3-4	70	0.55	1.40	236.38	287	82	72	0.742	50.9	3.231	100.7
3-5	75	0.65	1.70	239.95	284	82	72	0.806	55.2	3.466	99.2
4-1	80	0.20	0.52	242.65	285	83	72	0.447	30.7	2.611	134.8
4-2	85	0.19	0.49	244.56	288	83	73	0.436	29.9	1.845	98.0
4-3	90	0.38	0.98	247.28	289	83	73	0.616	42.4	2.631	98.8
4-4	95	0.56	1.40	250.62	290	83	73	0.748	51.5	3.234	100.1
4-5	100	0.75	1.90	254.51	287	83	73	0.866	59.4	3.772	100.7
5-1	105	0.16	0.41	257.25	289	84	73	0.400	27.5	2.644	153.1
5-2	110	0.17	0.44	259.09	288	84	74	0.412	28.3	1.774	99.6
5-3	115	0.45	1.20	262.18	287	84	74	0.671	46.0	2.985	102.9
5-4	120	0.58	1.50	265.64	285	84	74	0.762	52.2	3.345	101.4
5-5	125	0.71	1.80	269.25	284	84	75	0.843	57.7	3.490	95.6

	Port 1 to 2	Port 2 to 3	Port 3 to 4	Port 4 to 5
Less Volumes for Between port Leak Checks	1.24	0.88	0.74	0.96

Totals and Averages

125	1.05	68.13	286	75.3	0.615	42.2	66.25	99.6

Project Number	4784
Client	MPU
Plant	Manitowoc, WI
Location	B-8
Date	9/9/2014
Meter ID	M-29
Y_d	1.0031
Pitot C_p	0.84

Nozzle Diameter (in)	0.253
Filter ID	30576
Train Type	IMP
Train ID	IB202-8
P_b (Inches Hg)	29.34
P_g (Inches H_2O)	-16.6
Start Time	10:45
Stop Time	12:57

Place an "x" in the appropriate Box

Circular?	
Rectangular?	x
Diameter	
Length	124.75
Width	60

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	601.7	526.9	74.8
Impinger 2	592.5	574.8	17.7
Impinger 3	622.4	596.6	25.8
Silica Gel	899.9	876.6	23.3
Weight of Water Collected, V_{wc} (g)			118.3
Silica Gel Net Weight, V_{weg} (g)			23.3

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.2	19.0	6.8
Trial 2	12.4	19.0	6.6
Trial 3	12.2	19.0	6.8
Average	12.3	NA	6.7

Run 2

Traverse Point	Min/Pt 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 270.60	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
1-1	5	0.18	0.45	272.77	290	72	71	0.424	29.2	2.122	115.8
1-2	10	0.20	0.50	274.72	291	73	71	0.447	30.8	1.905	98.7
1-3	15	0.35	0.86	277.35	289	75	71	0.592	40.6	2.567	100.4
1-4	20	0.56	1.40	280.71	292	76	71	0.748	51.5	3.281	101.6
1-5	25	0.68	1.70	284.35	290	77	71	0.825	56.7	3.554	99.8
2-1	30	0.17	0.43	286.99	284	77	71	0.412	28.2	2.569	143.7
2-2	35	0.17	0.43	288.79	285	77	71	0.412	28.3	1.752	98.0
2-3	40	0.40	1.00	291.55	289	77	71	0.632	43.5	2.690	98.4
2-4	45	0.55	1.40	294.67	292	78	71	0.742	51.1	3.041	95.0
2-5	50	0.68	1.70	298.51	290	78	71	0.825	56.7	3.746	105.1
3-1	55	0.17	0.43	300.79	287	78	71	0.412	28.3	2.217	124.2
3-2	60	0.16	0.40	302.49	289	78	71	0.400	27.5	1.653	95.6
3-3	65	0.42	1.10	305.41	292	78	72	0.648	44.6	2.841	101.6
3-4	70	0.58	1.50	308.88	290	78	72	0.762	52.4	3.380	102.7
3-5	75	0.63	1.60	312.35	293	79	72	0.794	54.7	3.378	98.7
4-1	80	0.16	0.40	314.63	292	79	72	0.400	27.5	2.213	128.2
4-2	85	0.16	0.40	316.34	291	79	72	0.400	27.5	1.659	96.1
4-3	90	0.49	1.30	319.52	290	79	72	0.700	48.1	3.093	102.3
4-4	95	0.55	1.40	322.92	292	79	72	0.742	51.1	3.308	103.4
4-5	100	0.68	1.70	326.58	294	79	72	0.825	56.8	3.563	100.3
5-1	105	0.18	0.45	329.23	292	80	72	0.424	29.2	2.570	140.4
5-2	110	0.19	0.48	331.18	293	80	72	0.436	30.0	1.891	100.6
5-3	115	0.36	0.90	333.61	292	80	73	0.600	41.3	2.357	91.0
5-4	120	0.46	1.20	336.67	292	80	73	0.678	46.7	2.970	101.5
5-5	125	0.62	1.60	340.27	290	80	73	0.787	54.1	3.498	102.8

	Port 1 to 2	Port 2 to 3	Port 3 to 4	Port 4 to 5
Less Volumes for Between port Leak Checks	0.84	0.53	0.55	0.62

Totals and Averages

125	0.989	67.13	290	74.7	0.603	41.4	65.34	100.4

Project Number	4784
Client	MPU
Plant	Manitowoc, WI
Location	B-8
Date	9/9/2014
Meter ID	M-29
Y_d	1.0031
Pitot C_p	0.84

Nozzle Diameter (in)	0.253
Filter ID	30577
Train Type	IMP
Train ID	IB202-6
P_b (Inches Hg)	29.34
P_s (Inches H_2O)	-16.6
Start Time	13:20
Stop Time	15:31

Place an "x" in the appropriate Box

Circular?	
Rectangular?	x
Diameter	
Length	124.75
Width	60

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	737.3	632.7	104.6
Impinger 2	605.8	602.6	3.2
Impinger 3	892.5	668.3	24.2
Silica Gel	915.6	899.8	15.8
Weight of Water Collected, V_{wc} (g)			132.0
Silica Gel Net Weight, V_{wsg} (g)			15.8

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.0	19.0	7.0
Trial 2	12.2	19.0	6.8
Trial 3	12.0	19.0	7.0
Average	12.1	NA	6.9

Run 3

Traverse Point	Min/Pt: 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3): 341.20	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
1-1	5	0.16	0.40	343.03	291	74	71	0.400	27.5	1.786	103.7
1-2	10	0.17	0.43	344.83	292	75	71	0.412	28.4	1.755	98.9
1-3	15	0.43	1.10	347.77	296	76	71	0.656	45.3	2.869	101.9
1-4	20	0.46	1.20	350.89	293	77	71	0.678	46.8	3.042	104.3
1-5	25	0.57	1.40	354.22	295	77	71	0.755	52.1	3.249	100.2
2-1	30	0.15	0.38	356.35	296	77	71	0.387	26.8	2.073	124.7
2-2	35	0.17	0.43	358.12	292	77	71	0.412	28.4	1.723	97.1
2-3	40	0.40	1.00	360.99	294	77	71	0.632	43.6	2.797	102.9
2-4	45	0.54	1.40	364.27	293	78	71	0.735	50.7	3.197	101.2
2-5	50	0.62	1.60	367.87	295	78	71	0.787	54.4	3.511	103.8
3-1	55	0.18	0.45	370.19	292	78	71	0.424	29.2	2.256	123.6
3-2	60	0.19	0.48	372.11	289	78	71	0.436	30.0	1.867	99.3
3-3	65	0.43	1.10	374.97	292	78	72	0.656	45.2	2.783	98.6
3-4	70	0.62	1.60	378.55	295	78	72	0.787	54.4	3.488	103.1
3-5	75	0.62	1.60	382.12	295	79	72	0.787	54.4	3.475	102.8
4-1	80	0.17	0.43	384.82	292	79	72	0.412	28.4	2.620	147.7
4-2	85	0.17	0.43	386.61	293	79	72	0.412	28.4	1.737	98.0
4-3	90	0.47	1.20	389.88	292	79	72	0.686	47.2	2.985	101.2
4-4	95	0.63	1.60	393.26	295	79	72	0.794	54.8	3.485	102.2
4-5	100	0.60	1.50	396.74	292	80	72	0.775	53.4	3.383	101.5
5-1	105	0.16	0.40	398.85	296	80	72	0.400	27.6	2.046	119.2
5-2	110	0.17	0.43	400.62	295	80	72	0.412	28.5	1.716	96.9
5-3	115	0.50	1.30	403.84	293	81	72	0.707	48.8	3.126	102.8
5-4	120	0.62	1.60	407.45	292	81	72	0.787	54.3	3.507	103.5
5-5	125	0.64	1.60	411.07	291	81	72	0.800	55.1	3.517	102.1

	Port 1 to 2	Port 2 to 3	Port 3 to 4	Port 4 to 5
Less Volumes for Between port Leak Checks	0.53	0.51	1.07	0.32

Totals and Averages

125	1.00	67.44	293	74.9	0.605	41.7	65.62	100.9

Project Number	4784
Client	MPU
Plant	Manitowoc, WI
Location	B9
Date	9/10/2014
Meter ID	M-29
Y_d	1.0031
Pitot C_p	0.84

Nozzle Diameter (in)	0.220
Filter ID	30578
Train Type	IMP
Train ID	IB202-8
P_b (Inches Hg)	29.03
P_s (Inches H_2O)	0.1
Start Time	7:48
Stop Time	10:00

Place an "x" in the appropriate Box

Circular?	x
Rectangular?	
Diameter	108
Length	
Width	

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	666.6	571.4	95.2
Impinger 2	513.1	506.6	6.5
Impinger 3	590.2	582.2	8.0
Silica Gel	911.6	888.3	23.3
Weight of Water Collected, V_{wc} (g)			109.7
Silica Gel Net Weight, V_{wsg} (g)			23.3

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.1	19.0	6.9
Trial 2	12.0	19.0	7.0
Trial 3	12.2	19.2	7.0
Average	12.1	NA	7.0

Run 1

Traverse Point	Min/Pt: 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3) 412.60	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
1-1	5	0.53	0.72	415.39	355	79	76	0.728	51.3	2.671	114.6
1-2	10	0.55	0.75	417.37	355	79	76	0.742	52.3	1.896	79.8
1-3	15	0.55	0.79	419.78	348	79	76	0.742	52.0	2.308	96.8
1-4	20	0.57	0.82	422.24	347	74	69	0.755	52.9	2.382	98.1
1-5	25	0.56	0.80	424.81	346	74	69	0.748	52.4	2.489	103.3
1-6	30	0.65	0.93	427.28	348	74	67	0.806	56.6	2.397	92.5
1-7	35	0.73	1.00	430.03	345	74	66	0.854	59.8	2.672	97.1
1-8	40	0.88	1.30	433.29	346	74	66	0.938	65.7	3.170	104.9
1-9	45	0.91	1.30	436.49	342	74	66	0.954	66.7	3.112	101.0
1-10	50	1.00	1.40	440.03	340	74	66	1.000	69.8	3.443	106.5
1-11	55	0.96	1.40	443.22	339	74	66	0.980	68.4	3.103	97.9
1-12	60	0.95	1.40	446.61	338	74	66	0.975	68.0	3.297	104.5
2-1	65	0.55	0.79	449.04	341	74	66	0.742	51.8	2.360	98.5
2-2	70	0.56	0.80	451.50	343	74	66	0.748	52.3	2.389	99.0
2-3	75	0.57	0.82	453.87	342	74	66	0.755	52.8	2.302	94.4
2-4	80	0.57	0.82	456.45	339	74	66	0.755	52.7	2.506	102.6
2-5	85	0.55	0.79	458.89	338	74	66	0.742	51.7	2.370	98.7
2-6	90	0.61	0.87	461.43	337	74	66	0.781	54.4	2.467	97.5
2-7	95	0.72	1.00	464.25	336	74	66	0.849	59.1	2.740	99.7
2-8	100	0.85	1.20	467.34	335	76	67	0.922	64.2	2.995	100.2
2-9	105	0.93	1.30	470.62	335	76	67	0.964	67.1	3.180	101.7
2-10	110	0.99	1.40	474.01	335	76	67	0.995	69.2	3.288	101.9
2-11	115	0.96	1.40	477.45	335	76	67	0.980	68.2	3.336	105.0
2-12	120	0.96	1.40	480.78	335	76	67	0.980	68.2	3.230	101.7

Totals and Averages

120		1.05	68.18	342	71.4	0.851	59.5	66.08	100.2

Project Number	4784
Client	MPU
Plant	Manitowoc, WI
Location	B9
Date	9/10/2014
Meter ID	M-29
Y_d	1.0031
Pitot C_p	0.84

Nozzle Diameter (in)	0.220
Filter ID	30579
Train Type	IMP
Train ID	IB202-1
P_b (inches Hg)	29.03
P_s (inches H_2O)	0.1
Start Time	10:38
Stop Time	12:52

Place an "x" in the appropriate Box

Circular?	x
Rectangular?	
Diameter	108
Length	
Width	

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	719.7	632.0	87.7
Impinger 2	607.8	604.5	3.3
Impinger 3	709.1	693.7	15.4
Silica Gel	935.1	915.4	19.7
Weight of Water Collected, V_{wc} (g)			106.4
Silica Gel Net Weight, V_{wg} (g)			19.7

Orsat	%CO_2	%CO_2+%O_2	%O_2
Trial 1	13.6	18.8	5.0
Trial 2	13.6	18.8	5.2
Trial 3	13.7	18.8	5.1
Average	13.6	NA	5.1

Run 2

Traverse Point	Min/Pt: 5 / Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (in. H_2O)	Gas Sample Volume Initial (ft^3): 481.10	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
2-1	5	0.55	0.79	483.57	338	74	68	0.742	51.5	2.394	99.6
2-2	10	0.55	0.79	486.03	339	74	68	0.742	51.6	2.385	99.3
2-3	15	0.57	0.82	488.49	341	74	68	0.755	52.5	2.385	97.7
2-4	20	0.56	0.80	490.92	340	74	68	0.748	52.0	2.355	97.3
2-5	25	0.55	0.79	493.38	339	74	68	0.742	51.6	2.385	99.3
2-6	30	0.60	0.85	495.92	338	74	68	0.775	53.8	2.462	98.1
2-7	35	0.72	1.00	498.73	339	74	68	0.849	59.0	2.725	99.2
2-8	40	0.86	1.20	501.75	338	75	68	0.927	64.4	2.928	97.4
2-9	45	0.93	1.30	505.04	336	75	68	0.964	66.9	3.190	102.0
2-10	50	0.98	1.40	509.47	338	75	68	0.990	68.8	4.287	133.9
2-11	55	1.00	1.40	511.88	337	76	68	1.000	69.4	2.335	72.0
2-12	60	0.96	1.40	515.29	337	76	68	0.980	68.0	3.304	104.0
1-1	65	0.52	0.74	517.66	338	76	68	0.721	50.1	2.293	98.1
1-2	70	0.53	0.76	520.05	339	76	68	0.728	50.6	2.312	98.1
1-3	75	0.55	0.79	522.62	338	76	68	0.742	51.5	2.486	103.5
1-4	80	0.55	0.79	524.99	339	76	68	0.742	51.6	2.293	95.5
1-5	85	0.57	0.82	527.49	337	76	68	0.755	52.4	2.419	98.8
1-6	90	0.62	0.89	530.08	337	76	68	0.787	54.7	2.506	98.2
1-7	95	0.69	0.99	532.88	338	77	69	0.831	57.7	2.705	100.5
1-8	100	0.85	1.20	536.07	339	78	69	0.922	64.1	3.081	103.2
1-9	105	0.92	1.30	539.38	339	78	69	0.959	66.7	3.198	102.9
1-10	110	0.97	1.40	542.83	337	78	69	0.985	68.4	3.334	104.4
1-11	115	0.98	1.40	546.25	338	79	69	0.990	68.8	3.302	102.9
1-12	120	0.98	1.40	549.72	338	79	69	0.990	68.8	3.350	104.4
						1820	1638				

Totals and Averages

120	1.04	68.62	338	72.0	0.849	59.0	66.43	100.7

Project Number	4784
Client	MPU
Plant	Manitowoc, WI
Location	B9
Date	9/10/2014
Meter ID	M-29
Y_d	1.0031
Pitot C_p	0.84

Nozzle Diameter (in)	0.220
Filter ID	30594
Train Type	IMP
Train ID	IB202-8
P_b (Inches Hg)	29.03
P_s (Inches H_2O)	0.1
Start Time	13:25
Stop Time	15:35

Place an "x" in the appropriate Box

Circular?	x
Rectangular?	
Diameter	108
Length	
Width	

Moisture	Final Wt (g)	Tare Wt (g)	Net Wt (g)
Impinger 1	639.0	549.0	90.0
Impinger 2	508.9	508.9	0.0
Impinger 3	617.9	590.1	27.8
Silica Gel	934.8	911.1	23.7
Weight of Water Collected, V_{wc} (g)			117.8
Silica Gel Net Weight, V_{wsg} (g)			23.7

Orsat	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$
Trial 1	12.2	19.1	6.9
Trial 2	12.3	19.0	6.7
Trial 3	12.2	18.9	6.7
Average	12.2	NA	6.8

Run 3

Traverse Point	Min/Pt: 5 Elapsed Time	Velocity Pressure Δ P (in. H_2O)	Orifice Setting Δ H (In. H_2O)	Gas Sample Volume Initial (ft^3): 550.00	Stack Temp. (°F)	DGM Inlet (°F)	DGM Outlet (°F)	Square Root Δ P	Stack Gas Velocity Vs (ft/sec)	Volume Metered Vmstd (ft^3)	Isokinetics (%)
1-1	5	0.52	0.74	552.38	335	76	72	0.721	50.2	2.294	98.6
1-2	10	0.54	0.77	554.78	336	76	72	0.735	51.2	2.313	97.6
1-3	15	0.54	0.77	557.21	338	79	73	0.735	51.3	2.333	98.6
1-4	20	0.56	0.80	559.75	336	81	74	0.748	52.2	2.432	100.8
1-5	25	0.55	0.79	562.19	337	81	74	0.742	51.7	2.337	97.8
1-6	30	0.61	0.87	564.74	337	83	75	0.781	54.5	2.436	96.8
1-7	35	0.73	1.00	567.54	338	85	77	0.854	59.6	2.665	96.9
1-8	40	0.88	1.30	570.81	336	87	77	0.938	65.4	3.109	102.8
1-9	45	0.92	1.30	574.11	337	87	77	0.959	66.9	3.138	101.5
1-10	50	1.00	1.40	577.63	338	88	78	1.000	69.8	3.342	103.8
1-11	55	0.97	1.40	580.99	337	88	78	0.985	68.7	3.190	100.5
1-12	60	0.96	1.40	584.38	338	88	78	0.980	68.4	3.218	102.0
2-1	65	0.55	0.79	586.88	333	82	79	0.742	51.6	2.381	99.4
2-2	70	0.55	0.79	589.34	336	84	79	0.742	51.7	2.338	97.8
2-3	75	0.56	0.80	591.84	335	86	79	0.748	52.1	2.372	98.2
2-4	80	0.55	0.79	594.33	337	87	79	0.742	51.7	2.360	98.8
2-5	85	0.60	0.86	596.93	338	88	80	0.775	54.1	2.460	98.6
2-6	90	0.61	0.87	599.61	337	88	80	0.781	54.5	2.536	100.8
2-7	95	0.75	1.10	602.57	336	89	80	0.866	60.4	2.800	100.3
2-8	100	0.89	1.30	605.82	336	89	80	0.943	65.7	3.076	101.1
2-9	105	0.91	1.30	609.11	337	91	81	0.954	66.5	3.105	101.0
2-10	110	0.95	1.40	612.63	338	91	81	0.975	68.0	3.323	105.9
2-11	115	0.99	1.40	615.94	336	91	81	0.995	69.3	3.125	97.4
2-12	120	0.97	1.40	619.37	336	92	82	0.985	68.6	3.232	101.8

Totals and Averages

120		1.06	69.37	337	81.7	0.851	59.3	65.95	100.2

Field Data

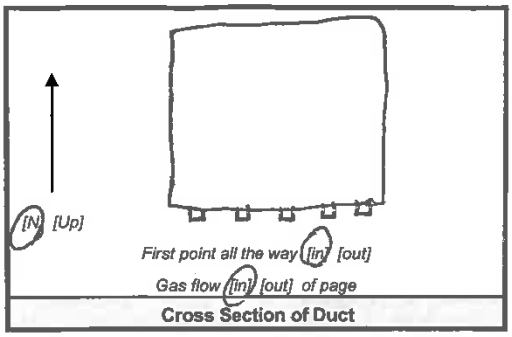
AIRTECH ENVIRONMENTAL SERVICES INC

EPA Method 1

Sample and Velocity Traverses Datasheet

LOCATION B8

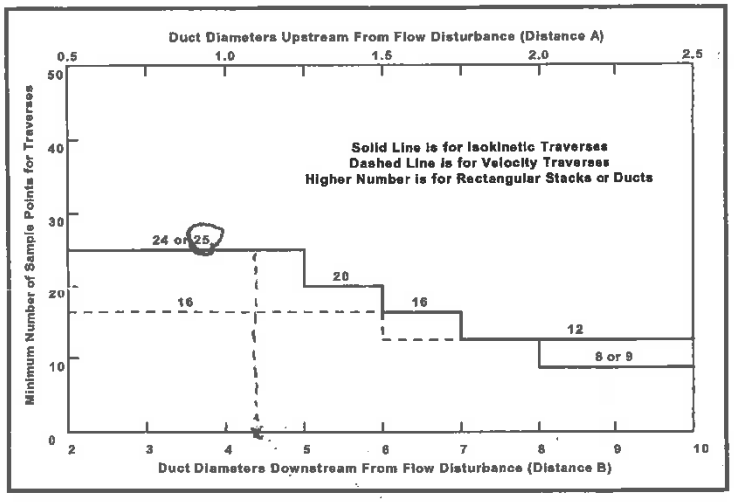
Client	MPU
Project No:	4784
Plant	Mtn. to Woc, WI
Date	7-9-14
Technician	RK / BrK
Duct Diameter (in.)	124.75 x 60.0
Port Diameter (in.)	5.5
Port Length (in.)	12.
Port Type	NIPPLE (MALE)
Distance A (ft)	721.15" – 60.095'
Distance B (ft)	356.5" – 29.71'
Distance A (Duct Diameters)	8.9
Distance B (Duct Diameters)	4.4



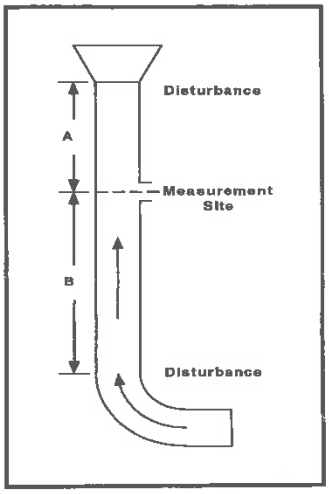
Cross Section of Duct

For rectangular ducts 81.0284

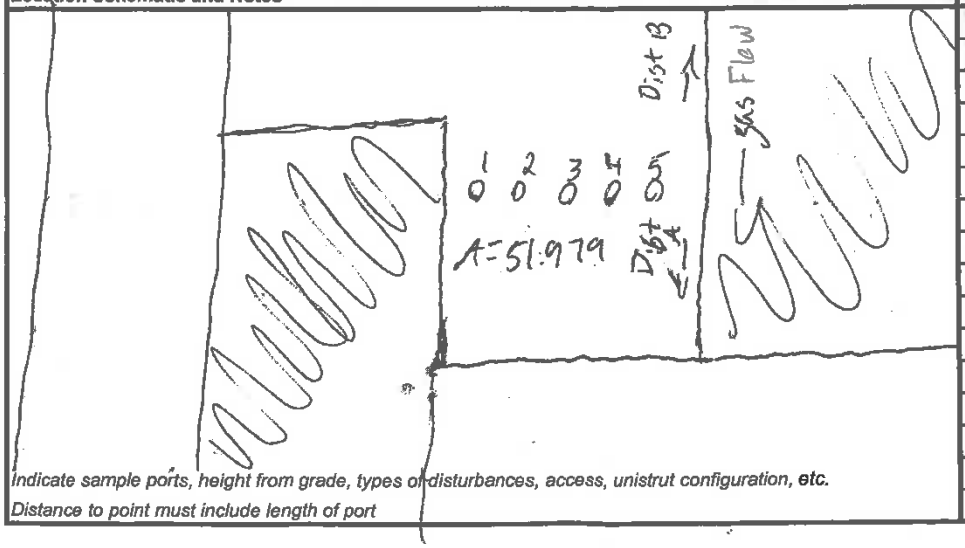
$$ED = \frac{2LW}{(L+W)}$$



x8.9



Location Schematic and Notes



Indicate sample ports, height from grade, types of disturbances, access, unistrut configuration, etc.

Distance to point must include length of port

Traverse Point	Distance (in.)
1	24.50
2	49.40
3	74.40
4	99.30
5	124.30
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 1 METHOD NO. 5/202

Page 1 of 2

Client	MPU						
Plant	Manitowoc, WI						
Location	Boiler 8						
Date	9-9-14	Project No.	4784				
Meter Operator	Brk						
Probe Operator	BC						
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84		
ΔH@	1.8053	Kf	2.58	Leak check	✓		
Pre Leak Check	.001	[cfm] [lpm] @	18	(inHg)			
Post Leak Check	.001	[cfm] [lpm] @	21	(inHg)			

(IN) [Up]

1 2 3 4 5

First point all the way [in] [out]

Gas flow [in] [out] of page

Cross Section of Duct

Barometric (in. Hg)	29.34	Water (ml)(g)	124.8
Ambient Temp. (°F)	65	Silica gel (g)	20.5
Static (in. H_2O)	-16.6	Total Vlc	145.3
Probe ID	AE-5-10-5	Liner Type	Glass
Nozzle ID	.250	Nozzle Dia (in.)	.253
Filter ID	30575		
Train ID	IB202-6	Train Type	FMP
Duct Dim. (in.)	124.75	Port Lgth. (in.)	12.0
Start Time	0800	Stop Time	1018

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [ft^3] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				197.30		250	256						
1-1	5	.17	.44	199.42	284	255	254	60	68	65	5	66	
2	10	.17	.44	201.27	285	255	248	59	69	65	5	68	
3	15	.38	.98	203.79	285	254	255	58	71	68	8	69	
4	20	.63	1.6	207.33	285	255	255	58	76	68	12	71	
5	25	.75	1.9	211.17	285	255	254	55	77	68	14	73	Port change-0825-0828
2-1	30	.17	.44	214.25	285	253	255	54	77	69	5	75	New initial-212.41
2	35	.16	.41	216.02	284	255	256	52	77	69	5	76	Brk
3	40	.38	.98	218.65	286	255	254	55	77	69	9	77	
4	45	.59	1.5	222.01	285	256	255	55	78	70	12	78	Port change-08-53-0856
5	50	.71	1.8	225.75	286	255	255	56	80	71	14	78	New initial-226.63
3-1	55	.19	.49	228.54	288	255	254	57	81	71	5	77	Brk
2	60	.19	.49	230.47	287	256	255	57	81	71	5	76	Brk
Total	125	15.3594	26.39	68.14	7153				1792	1771			
Average		.6148	1.0556		286.12				75.32				

11.7 68.13 3425 912 824

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

MPU04361

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

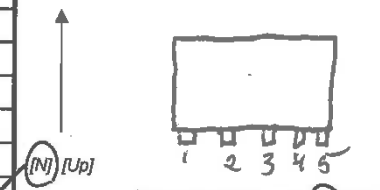
TESTING TYPE: Particulate

RUN NO. 1

METHOD NO. 5/202

Page 2 of 2

Client	MPU				
Plant	Manitowoc, WI				
Location	Boiler #8				
Date	9-9-14	Project No.	4784		
Meter Operator	BCW				
Probe Operator	BC				
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84
ΔH@	1.8063	Kf	2.58	Leak check	✓
Pre Leak Check	.001	[cfm] [lpm] @		18	(inHg)
Post Leak Check	.001	[cfm] [lpm] @		21	(inHg)



Cross Section of Duct

Barometric (in. Hg)	29.34	Water (ml) (g)	124.8
Ambient Temp. (°F)	65	Silica gel (g)	20.5
Static (in. H_2O)	-16.6	Total Vlc	145.3
Probe ID	AE-5-10-5	Liner Type	Glass
Nozzle ID	.250	Nozzle Dia (in.)	.253
Filter ID	30575	—	—
Train ID	FB202-5	Train Type	Imp
Duct Dim. (in.)	124.75	Port Lgth. (in.)	12.0
Start Time	0800	Stop Time	1018

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [ft^3] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				197.30		250	250						
3	65	.37	.95	233.05	285	255	256	58	81	72	8	75	
4	70	.55	1.4	236.38	287	255	255	59	82	72	12	75	
5	75	.66	1.7	239.95	284	255	254	57	82	72	14	73	Port Change: 0930-0935
4-1	80	.20	.52	242.65	285	253	254	55	83	72	5	73	New Initial: 240.69
2	85	.19	.49	244.56	288	256	255	56	83	73	5	72	BCW
3	90	.38	.98	247.28	289	256	256	58	83	73	9	72	
4	95	.56	1.4	250.62	290	256	256	58	83	73	12	72	
5	100	.75	1.9	254.81	287	255	256	59	83	73	14	73	
5-1	105	.16	.41	257.25	289	254	256	61	84	73	5	75	Port Change - 0950-0953
2	110	.17	.44	259.09	288	254	249	62	84	74	5	76	New initial - 255.47
3	115	.45	1.2	262.18	287	256	252	63	84	74	12	76	BCW
4	120	.58	1.5	265.64	285	254	255	63	84	74	14	77	
~~Total~~ 5	125	.71	1.8	269.25	284	255	255	64	84	75	14	78	
~~Average~~	Total	15.3694	26.39	68.14	~~286.12~~				1492	1774			
	AVG.	.6148	1.0556		286.12				75.32				

Circle correct bracketed [ ] units
Train Type denotes impingers, knockouts, etc.

Total = 7153

MPU04362

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

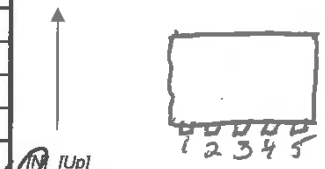
TESTING TYPE: Particulate

RUN NO. 2

METHOD NO. 5/202

Page 1 of 2

Client	MPU						
Plant	Manitowoc, WI						
Location	Boiler #8						
Date	9-9-14	Project No.	4784				
Meter Operator	Brk						
Probe Operator	BC						
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84		
ΔH@	1.8063	Kf	2.50	Leak check	✓		
Pre Leak Check	.001	[cfm] [lpm] @		19	(inHg)		
Post Leak Check	.001	[cfm] [lpm] @		22	(inHg)		



Barometric (in. Hg)	29.34	Water (ml) (g)	118.3
Ambient Temp. (°F)	73	Silica gel (g)	23.3
Static (in. H_2O)	-16.6	Total Vlc	141.6
Probe ID	AE-5-10-5	Liner Type	9/a65
Nozzle ID	.250	Nozzle Dia (in.)	.253
Filter ID	30576		
Train ID	IB207-8	Train Type	IMP
Duct Dim. (in.)	124.75	Port Lgth. (in.)	12.0
Start Time	1045	Stop Time	1254

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [f] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				270.60		250	250						
1-1	5	.18	.45	272.77	290	251	252	52	72	71	5	70	
2	10	.20	.5	274.72	291	251	253	51	73	71	5	70	
3	15	.35	.86	277.35	289	256	258	53	75	71	7	71	
4	20	.56	1.4	280.71	292	256	258	53	76	71	12	68	
5	25	.68	1.7	284.35	290	256	258	54	77	71	14	65	Port change - 1110 - 1112
2-1	30	.17	.43	286.99	284	251	253	55	77	71	5	68	New initial - 285.99
2	35	.17	.43	288.79	285	254	253	56	77	71	5	69	Brk
3	40	.40	1.0	291.55	289	257	256	56	77	71	9	67	
4	45	.55	1.4	294.67	292	256	258	58	78	71	12	69	
5	50	.68	1.7	298.51	290	255	257	59	78	71	14	71	Port change - 1137 - 1139
3-1	55	.17	.43	300.79	287	256	257	60	78	71	5	71	New Initial - 299.04
2	60	.16	.40	302.49	289	254	255	61	78	71	5	72	Brk
Total	125	15.0671	24.73	67.13	7261				1946	1791			
Average		6.027	.9892		290.44				74.74				
			10.7		3468				916	852			

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

MPU04363

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 2

METHOD NO. 5/202

Page 2 of 2

Client	MPU						
Plant	Manitowoc, WI						
Location	Boiler #8						
Date	9-9-14	Project No.	4784				
Meter Operator	Bre						
Probe Operator	BC						
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84		
ΔH@	1.8063	Kf	2.50	Leak check	✓		
Pre Leak Check	.001	[cfm] [lpm] @	18	(inHg)			
Post Leak Check	.001	[cfm] [lpm] @	22	(inHg)			

[IN] /[Up]

1 2 3 4 5

First point all the way [in] [out]

Gas flow [in] [out] of page

Cross Section of Duct

Barometric (in. Hg)	29.34	Water (ml) (g)	118.3
Ambient Temp. (°F)	73	Silica gel (g)	23.3
Static (in. H_2O)	-15.6	Total Vlc	141.6
Probe ID	AE-5-105	Liner Type	glass
Nozzle ID	.250	Nozzle Dia (in.)	.257
Filter ID	30576	—	—
Train ID	IB202-8	Train Type	IMP
Duct Dim. (in.)	124.75	Port Lgth. (in.)	12.0
Start Time	1045	Stop Time	1257

Traverse Point	Min/Point 5 ← Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [cf] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				270.60		250	250						
3-3	65	.42	1.1	305.41	292	257	258	57	78	72	10	70	
4	70	.58	1.5	308.88	290	256	254	56	78	72	13	69	
5	75	.63	1.6	312.35	293	255	254	55	79	72	14	68	Port Change - 1204 - 1205
4-1	80	.16	.40	314.53	292	255	253	54	77	72	5	68	New Initial - 312.90
2	85	.16	.40	316.34	291	251	255	54	77	72	5	69	(Brw)
3	90	.49	1.3	319.52	290	258	259	53	79	72	13	66	
4	95	.55	1.4	322.92	292	257	254	53	79	72	14	67	
5	100	.68	1.7	326.58	294	255	256	54	79	72	14	67	
5-1	105	.18	.45	329.23	292	256	255	54	80	72	5	68	Port Change - 1230 - 1231
2	110	.19	.48	331.18	293	257	255	55	80	72	5	68	New Initial - 327.20
3	115	.36	.90	333.61	292	253	248	57	80	73	12	67	(Brw)
4	120	.46	1.2	336.67	292	254	252	58	80	73	14	69	
~~Total~~ 5	125	.62	1.6	340.27	290	255	255	59	80	73	15	70	
~~Average~~	total	15.0671	24.73	67.13	7261				1946	1791			
	Avg.	.6027	.9892		290.44				74.74				

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

MPU04364

AIRTECH ENVIRONMENTAL SERVICES, INC.

General Testing Datasheet

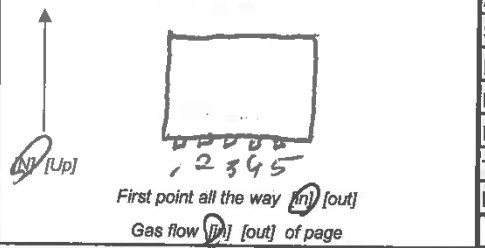
TESTING TYPE: Particulate

RUN NO. 3

METHOD NO. 5/202

Page 1 of 2

Client	MPU				
Plant	Manitowoc, WI				
Location	Boiler #8				
Date	9-9-14	Project No.	4784		
Meter Operator	BM				
Probe Operator	BC				
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84
ΔH@	1.8063	Kf	2.50	Leak check	✓
Pre Leak Check	.001	[cfm] [lpm] @	21	(inHg)	
Post Leak Check	.001	[cfm] [lpm] @	22	(inHg)	



Cross Section of Duct

Barometric (in. Hg)	29.34	Water (ml) (g)	132.0
Ambient Temp. (°F)	70	Silica gel (g)	15.8
Static (in. H_2O)	-16.6	Total Vic	147.8
Probe ID	AE-5.10-5	Liner Type	Glass
Nozzle ID	.250	Nozzle Dia (in.)	.253
Filter ID	30577-600		
Train ID	TB202-1	Train Type	Imp
Duct Dim. (in.)	124.75	Port Lgth. (in.)	12.0
Start Time	1320	Stop Time	1531

Traverse Point	Min/Point 5 / Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [f] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				341.20		250	250						
1-1	5	.16	.40	343.03	291	244	254	62	74	71	5	69	
2	10	.17	.43	344.83	292	252	255	60	75	71	5	70	
3	15	.43	1.1	347.77	296	257	252	59	76	71	8	70	
4	20	.46	1.2	350.89	293	259	258	57	77	71	10	73	
5	25	.57	1.4	354.22	295	255	257	57	77	71	12	74	Port change - 1345 - 1347
2-1	30	.15	.38	356.35	296	248	254	58	77	71	5	74	New Initial - 354.75
2	35	.17	.43	358.12	292	255	256	59	77	71	5	74	(BC)
3	40	.40	1.0	360.99	294	259	253	60	77	71	8	75	
4	45	.54	1.4	364.27	293	258	258	57	78	71	12	78	
5	50	.62	1.6	367.87	295	255	254	56	78	71	14	79	Port change - 1412 - 1413
3-1	55	.18	.45	370.19	292	254	255	55	78	71	5	80	New Initial - 368.38
2	60	.19	.48	372.11	289	253	254	56	78	71	5	80	(BC)
Total	125	15.1316	25.05	67.44	7332				1956	1788			
Average		.6053	1.0024		293.28				74.88				
				10.27	3518				922	852			

Circle correct bracketed [ ] units.
Train Type denotes impingers, knockouts, etc.

MPU04365

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 3 METHOD NO. 5/202

Client	MPU				
Plant	Manitowoc, WI				
Location	Boiler #8				
Date	9-9-14	Project No.	4784		
Meter Operator	Rck				
Probe Operator	BC				
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84
ΔH@	1.8063	Kf	2.50	Leak check	✓
Pre Leak Check	.001	[cfm] [lpm] @	21	(inHg)	
Post Leak Check	.001	[cfm] [lpm] @	22	(inHg)	

Cross Section of Duct

Barometric (In. Hg)	29.34	Water (ml) (g)	132.0
Ambient Temp. (°F)	70	Silica gel (g)	15.8
Static (In. H_2O)	-16.6	Total Vlc	147.8
Probe ID	AE-5-10-5	Liner Type	Glass
Nozzle ID	.250	Nozzle Dia (in.)	.253
Filter ID	30577	—	—
Train ID	LB202-1	Train Type	Imp
Duct Dim. (in.)	124.75	Port Lgth. (in.)	12.0
		Start Time	1320
		Stop Time	1531

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [f] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				341.20		250	250						
3-3	65	.43	1.1	374.97	292	261	261	57	78	72	9	79	
4	70	.62	1.6	378.55	295	258	258	57	78	72	14	78	
5	75	.62	1.6	382.12	295	256	254	58	79	72	14	77	Port Change - 1437 - 1439
4-1	80	.17	.43	384.82	292	248	248	59	79	72	5	77	New Initial - 383.19
2	85	.17	.43	386.61	293	249	252	59	79	72	5	76	BrC
3	90	.47	1.2	389.68	292	259	258	61	79	72	10	74	
4	95	.63	1.6	393.26	295	258	256	62	79	72	14	73	
5	100	.60	1.5	396.74	292	255	255	62	80	72	13	75	
5-1	105	.16	.40	398.85	296	254	258	60	80	72	5	76	Port Change - 1504 - 1506
2	110	.17	.43	400.62	295	253	259	59	80	72	5	77	New Initial - 397.06
3	115	.50	1.3	403.84	293	255	251	58	81	72	10	75	BrC
4	120	.62	1.6	407.45	292	255	255	56	81	72	12	73	
~~Total~~ 5	125	.64	1.6	411.07	291	254	256	56	81	72	14	71	
~~Average~~	Total	15.1316	25.06	67.44	7332				1956	1788			
	AVG.	.6053	1.0024		293.28				74.88				

Circle correct bracketed [ ] units

Train Type denotes Impingers, Knockouts, etc.

MPU04366

AIRTECH ENVIRONMENTAL SERVICES INC.

Impinger Weights Datasheet

PROJECT NO. 4784

Page	1	of	1

Client	MPU		
Plant	MANITOWOC, WI		
Location	B8		
Date	9/8/14	Unit	B8
Operator	RK		

Run No.	1				
Method No.	5/202	Train ID	1B202-6	Filter No.	30575

	Contents	Tare with Contents (g)	Final (g)	Total (g)	Notes
Impinger No. 1	EMPTY	583.5	697.4	113.9	
Impinger No. 2	EMPTY	613.8	616.3	2.5	
Impinger No. 3	100 ML DI	659.9	668.3	8.4	
Impinger No. 4	SILICA	879.3	899.8	20.5	
Impinger No. 5					
Impinger No. 6					
Impinger No. 7					
Additional Rinse					
			Net Weight (g)	145.3	

Run No.	2				
Method No.	5/202	Train ID	1B-202-8	Filter No.	30576

	Contents	Tare with Contents (g)	Final (g)	Total (g)	Notes
Impinger No. 1	EMPTY	526.9	601.7	74.8	
Impinger No. 2	EMPTY	574.8	592.5	17.7	
Impinger No. 3	100 ML DI	596.6	622.4	25.8	
Impinger No. 4	SILICA	876.6	899.9	23.3	
Impinger No. 5					
Impinger No. 6					
Impinger No. 7					
Additional Rinse					
			Net Weight (g)	141.6	

Run No.	3				
Method No.	5/202	Train ID	1B202-6	Filter No.	30577

	Contents	Tare with Contents (g)	Final (g)	Total (g)	Notes
Impinger No. 1	EMPTY	632.7	737.3	104.6	
Impinger No. 2	EMPTY	602.6	605.8	3.2	
Impinger No. 3	100 ML DI	668.3	692.5	24.2	
Impinger No. 4	SILICA	899.8	915.6	15.8	
Impinger No. 5					
Impinger No. 6					
Impinger No. 7					
Additional Rinse					
			Net Weight (g)	147.8	

AIRTECH ENVIRONMENTAL SERVICES INC.

Method 3B, Orsat Analyzer Datasheet

PROJECT NO. 4784

Page	1	of	1

Client	MPU		
Plant	MANITOWOC, WI		
Location	B-8	Date	9/9/14
Analyzer Type	ORSAT	Leak Check	✓

$F_0 = \frac{(20.9 - O_2\%)}{CO2\%}$

Run No.	Trial No.	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$	F_O	Analyst	Date	Time
Ambient Air	Check	0.02	21.02	21.0		RK	9/9/14	
Run No.	**Trial No.**	**$\%CO_2$**	**$\%CO_2+\%O_2$**	**$\%O_2$**	**F_O**	**Analyst**	**Date**	**Time**
1	1	12.4	18.8	6.4		RK	9/9/14	
	2	12.4	18.8	6.4				
	3	12.2	18.8	6.6				
	Average							
2	1	12.2	19.0	6.8		RK	9/9/14	
	2	12.4	19.0	6.6				
	3	12.2	19.0	6.8				
	Average							
3	1	12.0	19.0	7.0		RK	9/9/14	
	2	12.2	19.0	6.8				
	3	12.0	19.0	7.0				
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							

Notes:

Run an ambient air check to verify Oxsorb.

Measurements must be made to the nearest 0.2%.

Three different trails should be performed for each sample.

The differences between the trials must not be greater than 0.2% overall.

Expected F_o Ranges

Anthracite/Lignite	1.015-1.130	Nat. Gas	1.600-1.836
Bituminous	1.083-1.230	Wood Bark	1.000-1.120
Distillate Oil	1.260-1.413	Municiple	
Residual Oil	1.210-1.370	Garbage	1.043-1.177

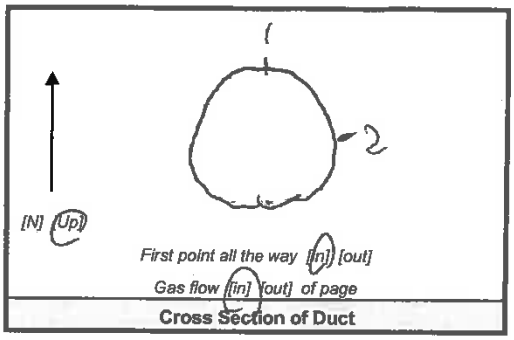
AIRTECH ENVIRONMENTAL SERVICES INC

EPA Method 1

Sample and Velocity Traverses Datasheet

LOCATION Boiler 9

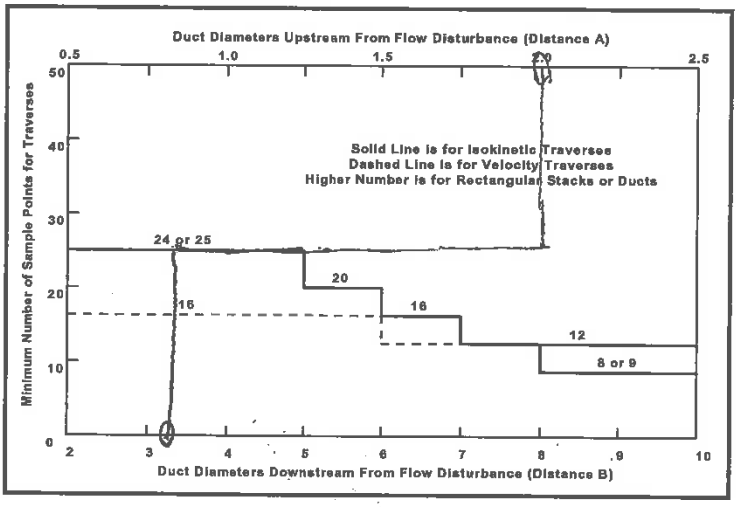
Client	MPU
Project No:	4784
Plant	Manitowoc, WI
Date	9-10-14
Technician	BLK
Duct Diameter (in.)	108.0
Port Diameter (in.)	5.5
Port Length (in.)	11.0
Port Type	Flange
Distance A (ft)	~~2.0~~ 216" - 18'
Distance B (ft)	356.4" - 29.7'
Distance A (Duct Diameters)	2.0
Distance B (Duct Diameters)	3.3

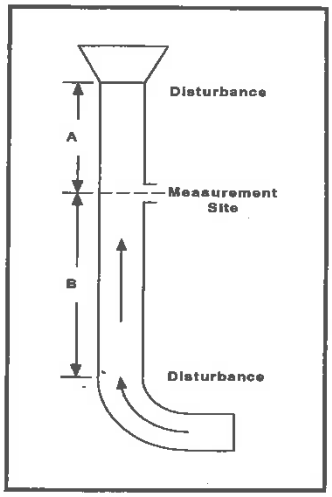


Cross Section of Duct

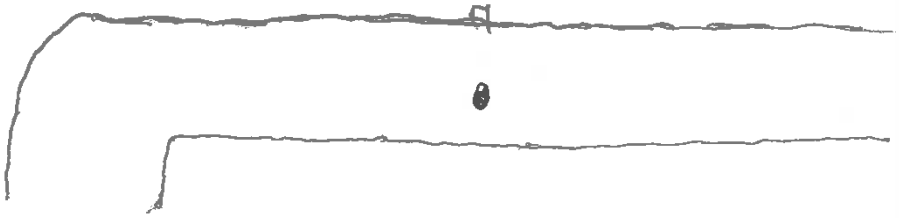
For rectangular ducts

$$ED = \frac{2LW}{(L+W)}$$





Location Schematic and Notes



Indicate sample ports, height from grade, types of disturbances, access, unistrut configuration, etc.
Distance to point must include length of port

Traverse Point	Distance (in.)
1	12.3
2	18.2
3	23.8
4	30.0
5	38.0
6	49.4
7	70.6
8	92.0
9	99.9
10	106.2
11	111.8
12	116.7
13	
14	
15	
16	

80.6 ea

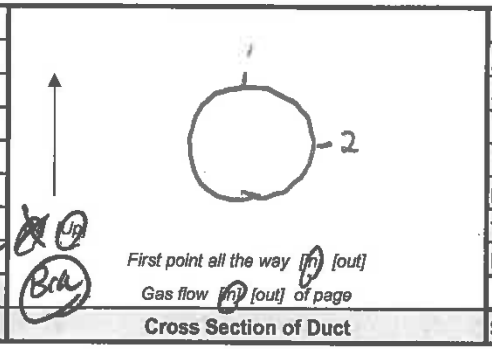
AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 1 METHOD NO. 5/202 Page 1 of 2

Client	MPU						
Plant	Manitowoc, WI						
Location	Boiler #9						
Date	9-10-14	Project No.	4784				
Meter Operator	BC						
Probe Operator	BC						
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84		
ΔH@	1.8063	Kf	1.36	Leak check	✓		
Pre Leak Check	.001	[cfm] [lpm] @	19	(inHg)			
Post Leak Check	.001	[cfm] [lpm] @	20	(inHg)			



Barometric (In. Hg)	29.63	Water (ml) (g)	109.7
Ambient Temp. (°F)	73	Silica gel (g)	23.3
Static (in. H_2O)	.10	Total Vlc	133.0
Probe ID	AE5-105	Liner Type	Glass
Nozzle ID	.220	Nozzle Dia (in.)	.220
Filter ID	30578		
Train ID	TB202-8	Train Type	FMP
Duct Dim. (in.)	108.0	Port Lgth. (in.)	11.0
Start Time	0746	Stop Time	1000

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [ft^3] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				412.60		250	250						
1-1	5	.53	.72	415.39	355	260	257	54	74	76	5	68	
2	10	.55	.75	417.37	355	259	258	55	74	76	5	69	New KF=1.43
3	15	.55	.79	419.78	348	258	258	57	74	76	5	69	BC
4	20	.57	.82	422.24	347	255	257	58	74	69	5	71	
5	25	.56	.80	424.81	346	255	257	59	74	69	5	72	
6	30	.65	.93	427.28	348	254	254	59	74	67	6	72	GSV@ 1-6 = 427.28
7	35	.73	1.0	430.03	345	253	254	60	74	66	6	74	BC
8	40	.88	1.3	433.29	346	252	255	61	74	66	7	76	
9	45	.91	1.3	436.49	342	254	256	57	74	66	8	72	
10	50	1.0	1.4	440.03	340	254	255	55	74	66	9	70	
11	55	.96	1.4	443.22	334	255	254	53	74	66	9	69	
12	60	.95	1.4	446.61	338	255	255	53	74	66	9	69	
Total	120	20.43	25.2	68.18	8194				1801	1626			
Average		.8516	1.05		341.4166				71.395				
		12.41			4143				903	~~892~~ 829			

Circle correct bracketed [ ] units
Train Type denotes impingers, knockouts, etc.

8300
342 a

MPU04370

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 1 METHOD NO. 5/202 Page 2 of 2

Client	MPU				Barometric (in. Hg)	29.03	Water (ml)(g)	109.7
Plant	Manitowoc, WI				Ambient Temp. (°F)	73	Silica gel (g)	23.3
Location	Boiler #9				Static (in. H_2O)	.10	Total Vlc	133.0
Date	9-10-14	Project No.	4284		Probe ID	AES-10-5	Liner Type	Glass
Meter Operator	BM				Nozzle ID	.220	Nozzle Dia (in.)	.220
Probe Operator	BC				Filter ID	30578		
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84	Train ID	IB-02-8	Train Type	IMP
ΔH@	1.8063	Kf	1.43	Leak check	✓	Duct Dim. (in.)	1080	Port Lgth. (in.)	11.0
Pre Leak Check	.001	[cfm] [lpm] @		10	(inHg)				
Post Leak Check	.001	[cfm] [lpm] @		20	(inHg)	Start Time	0745	Stop Time	1000

[N] [Up]

First point all the way [in] [out]

Gas flow [in] [out] of page

Cross Section of Duct

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [ft³] [l] 412.60	Stack Temp (°F)	Probe Temp (°F) 250	Filter Temp (°F) 250	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
2-1	65	.55	.79	449.04	341	258	252	56	74	66	5	70	
2	70	.56	.80	451.50	343	257	252	57	74	66	5	69	
3	75	.57	.82	453.87	342	256	254	58	74	66	5	68	
4	80	.57	.82	456.45	339	255	255	58	74	66	5	69	
5	85	.55	.79	458.89	338	255	255	59	74	66	5	70	
6	90	.61	.87	461.43	337	254	254	59	74	66	5	70	
7	95	.72	1.0	464.25	336	254	255	60	74	66	5	72	
8	100	.86	1.2	467.34	335	255	254	60	76	67	7	73	
9	105	.93	1.3	470.62	335	255	256	61	76	67	8	73	
10	110	.99	1.4	474.01	335	255	256	61	76	67	9	74	
11	115	.98	1.4	477.45	335	255	255	62	76	67	9	75	
12	120	.96	1.4	480.78	335	255	255	63	76	67	9		
Total	120	20.4391	25.2	68.18	8194				1801	1678			
Average		.8516	1.05		341.4166				71.375				

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

MPU04371

AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

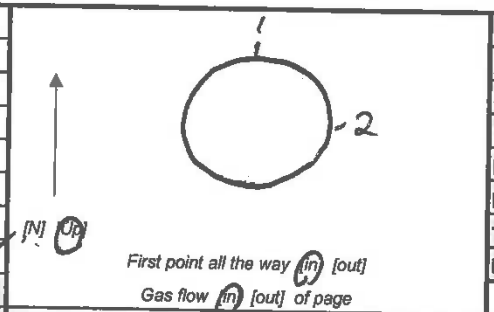
TESTING TYPE: Particulate

RUN NO. 2

METHOD NO. 5/202

Page 1 of 2

Client	MPU				
Plant	Manitowoc, WI				
Location	Boiler #9				
Date	9-10-14	Project No.	4784		
Meter Operator	BCK				
Probe Operator	BC				
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84
ΔH@	1.8063	Kf	1.43	Leak check	✓
Pre Leak Check	.001	[cfm] [lpm] @	18	(inHg)	
Post Leak Check	.001	[cfm] [lpm] @	19	(inHg)	



Barometric (in. Hg)	29.03	Water (ml) (g)	106.4
Ambient Temp. (°F)	73	Silica gel (g)	19.7
Static (in. H_2O)	.10	Total Vlc	126.1
Probe ID	AE5-12-5	Liner Type	Glass
Nozzle ID	.220	Nozzle Dia (in.)	.220
Filter ID	20579		
Train ID	TB-202-1	Train Type	TMP
Duct Dim. (in.)	108.0	Port Lgth. (in.)	11.0
Start Time	1038	Stop Time	1252

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial (ft³) [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				481.10		250	250						
2-1	5	.55	.74	483.57	338	258	251	51	74	68	5	67	
2	10	.55	.74	486.03	339	256	257	52	74	68	5	67	
3	15	.57	.82	488.49	341	255	256	52	74	68	5	69	
4	20	.56	.80	490.92	340	255	256	53	74	68	5	69	
5	25	.55	.79	493.38	339	256	255	54	74	68	5	70	
6	30	.60	.85	495.92	338	255	256	55	74	68	5	71	
7	35	.72	1.0	498.73	339	255	256	57	74	68	6	72	
8	40	.86	1.2	501.75	338	255	256	58	75	68	6	72	
9	45	.93	1.3	505.04	336	255	255	58	75	68	8	73	
10	50	.98	1.4	509.47	338	256	253	59	75	68	9	74	
11	55	1.0	1.4	511.88	337	257	255	60	76	68	9	75	
12	60	.96	1.4	515.29	337	255	254	62	76	68	9	73	
Total	120	20.3641	25.02	68.62	8117				1820	1638			
Average		.8485	1.0425		~~338.208~~ 338.208				72.8416				

12.54 4060 BCK 895 816 7204

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

AIRTECH ENVIRONMENTAL SERVICES INC.

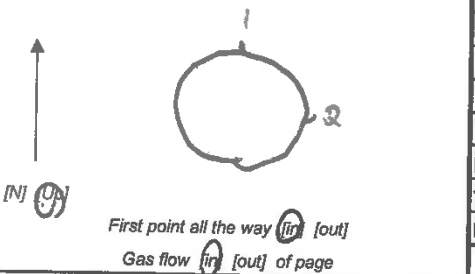
General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 2 METHOD NO. 5/202

Page 2 of 2

Client	MPU							Barometric (in. Hg)	29.03	Water (ml) (g)	106.4
Plant	Manitowoc, WI							Ambient Temp. (°F)	73	Silica gel (g)	19.7
Location	Boiler #9							Static (in. H_2O)	-10	Total Vic	126.1
Date	9-10-14	Project No.	4784					Probe ID	AE-5.105	Liner Type	Glass
Meter Operator	Brk							Nozzle ID	.220	Nozzle Dia (in.)	.220
Probe Operator	BC							Filter ID	30579		
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84			Train ID	TB-202-1	Train Type	IMP
ΔH@	1.8063	Kf	1.43	Leak check	✓			Duct Dim. (in.)	108.0	Port Lgth. (in.)	11.0
Pre Leak Check	.001	[cfm] [lpm] @		18	(inHg)						
Post Leak Check	.001	[cfm] [lpm] @		19	(inHg)			Start Time	1038	Stop Time	1252



Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [ft³] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				481.10		250	250						
1-1	65	.52	.74	517.66	338	257	256	61	76	68	6	68	
2	70	.53	.76	520.05	339	258	258	60	76	68	6	68	
3	75	.55	.79	522.62	338	257	256	58	76	68	6	67	
4	80	.55	.79	524.99	339	257	255	57	76	68	6	66	
5	85	.57	.82	527.49	337	256	256	56	76	68	6	66	
6	90	.62	.89	530.08	337	255	255	55	76	68	7	67	
7	95	.69	.99	532.88	338	255	256	55	77	69	7	68	
8	100	.85	1.2	536.07	339	255	256	57	78	69	9	69	
9	105	.92	1.3	539.38	339	254	256	58	78	69	9	69	
10	110	.97	1.4	542.83	337	254	255	58	78	69	10	69	
11	115	.98	1.4	546.25	338	255	255	59	79	69	10	70	
12	120	.98	1.4	549.72	338	255	255	59	79	69	10	70	
Total	120	20.3641	25.02	68.62	8117				1820	1638			
Average		.8485	1.0425		338.208				72.8416				

Circle correct bracketed [ ] units
Train Type denotes impingers, knockouts, etc.

MPU04373

AIRTECH ENVIRONMENTAL SERVICES INC.

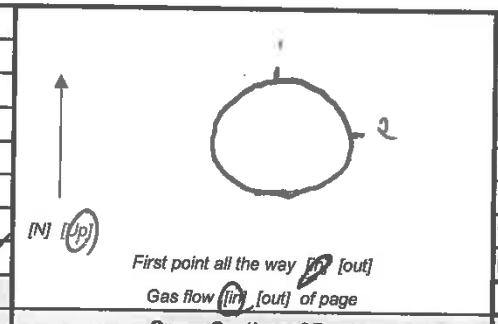
General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 3 METHOD NO. 5/202

Page 1 of 2

Client	MPU				
Plant	Manitowoc, WI				
Location	Boiler #9				
Date	9-10-14	Project No.	4708		
Meter Operator	BCK				
Probe Operator	BC				
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84
ΔH@	1.8063	Kf	1.43	Leak check	✓
Pre Leak Check	.001	[cfm] [lpm] @	17	(inHg)	
Post Leak Check	.001	[cfm] [lpm] @	18	(inHg)	



Cross Section of Duct

Barometric (In. Hg)	29.03	Water (ml) (g)	117.8
Ambient Temp. (°F)	75	Silica gel (g)	23.7
Static (in. H_2O)	.10	Total Vlc	141.5
Probe ID	AE5-10-5	Liner Type	Glass
Nozzle ID	.220	Nozzle Dia (In.)	.220
Filter ID	30584		
Train ID	IB202-8	Train Type	IB202-8
Duct Dim. (In.)	108.0	Port Lgth. (in.)	11.0
Start Time	1325	Stop Time	1535

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial [f] [l]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				550.00		250	250						
1-1	5	.52	.74	552.38	335	254	257	60	76	72	5	68	
2	10	.54	.77	554.78	336	260	259	59	76	72	5	68	
3	15	.54	.77	557.21	338	259	260	58	79	73	5	69	
4	20	.56	.80	559.75	336	257	260	57	81	74	5	70	
5	25	.55	.79	562.19	337	256	259	57	81	74	5	70	
6	30	.61	.87	564.74	337	256	254	56	83	75	5	69	
7	35	.73	1.0	567.54	338	255	255	55	85	77	6	68	
8	40	.88	1.3	570.81	336	254	255	56	87	77	8	66	
9	45	.92	1.3	574.11	337	255	254	55	87	77	8	64	
10	50	1.0	1.4	577.83	338	257	255	55	88	78	10	67	
11	55	.97	1.4	580.99	337	256	256	55	88	78	10	67	
12	60	.96	1.4	584.38	338	255	255	57	88	78	10	68	
Total	120	20.4248	25.34	29.37	8078				2057	1866			
Average		.8510	1.0558		336.58				81.7292				

12.54 4043 777 405

Circle correct bracketed [ ] units

Train Type denotes impingers, knockouts, etc.

MPU04374

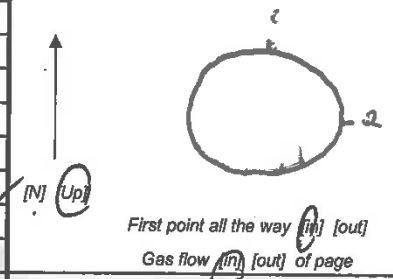
AIRTECH ENVIRONMENTAL SERVICES INC.

General Testing Datasheet

TESTING TYPE: Particulate

RUN NO. 3 METHOD NO. 5/202 Page 2 of 2

Client	MPU						
Plant	Manitowoc, WI						
Location	Boiler #9						
Date	9-10-14	Project No.	4788				
Meter Operator	Bra						
Probe Operator	BC						
Meter ID	M-29	Yd	1.0031	Pitot Cp	.84		
ΔH@	1.8063	Kf	1.43	Leak check	✓		
Pre Leak Check	.001	[cfm] [lpm] @	17	(inHg)			
Post Leak Check	.001	[cfm] [lpm] @	18	(inHg)			



Barometric (In. Hg)	29.03	Water (ml) (g)	117.8
Ambient Temp. (°F)	75	Silica gel (g)	23.7
Static (In. H_2O)	.10	Total Vlc	141.5
Probe ID	AE-5-10-5	Liner Type	Glass
Nozzle ID	.220	Nozzle Dia (In.)	.229
Filter ID	30594	—	—
Train ID	EB-202-8	Train Type	Imp
Duct Dim. (In.)	108.0	Port Lgth. (In.)	11.0
Start Time	1325	Stop Time	1535

Traverse Point	Min/Point 5 Elapsed Time	Velocity Pressure ΔP (in H_2O)	Orifice Setting ΔH (in H_2O)	Gas Sample Volume Initial (°F) [I]	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Impinger Outlet Temp (°F)	DGM Inlet Temp (°F)	DGM Outlet Temp (°F)	Pump Vacuum (in Hg)	Auxiliary Temp (°F)	Notes
				550.00		250	250						
2-1	65	.55	.79	586.88	333	254	256	57	82	79	5	67	Start time = 1325 Bra
2	70	.55	.79	589.34	336	257	249	57	84	79	5	67	
3	75	.56	.80	591.84	335	255	254	58	86	79	5	68	
4	80	.55	.79	594.33	337	255	255	59	87	79	5	69	
5	85	.60	.86	596.93	338	255	254	59	88	80	5	69	
6	90	.61	.87	599.61	337	255	255	59	88	80	5	70	
7	95	.75	1.1	602.57	336	255	256	58	89	80	6	70	
8	100	.89	1.3	605.82	336	255	255	59	89	80	6	72	
9	105	.91	1.3	609.11	337	255	255	57	91	81	8	73	
10	110	.95	1.4	612.63	338	256	254	61	91	81	9		
11	115	.99	1.4	615.94	336	255	256	62	91	81	9		
12	120	.97	1.4	619.37	336	255	255	62	92	82	10		
Total	120	20.4248	25.34	69.37	8078				2057	1866			
Average		.8510	1.0558		336.58				81.7298				

Circle correct bracketed [ ] units
Train Type denotes impingers, knockouts, etc.

MPU04375

AIRTECH ENVIRONMENTAL SERVICES INC.

Impinger Weights Datasheet

PROJECT NO. 4784

Page 1 of 1

Client	MPU		
Plant	MANITOWOC, WI		
Location	B-9		
Date	9/9/14	Unit	B-9
Operator	RK		

Run No.	1				
Method No.	5/202	Train ID	1B-202-8	Filter No.	30578
	Contents	Tare with Contents (g)	Final (g)	Total (g)	Notes
Impinger No. 1	EMPTY	571.4	666.6	95.2	
Impinger No. 2	EMPTY	506.6	513.1	65	
Impinger No. 3	100 ML DI	~~622.4~~	590.2	8.0	582.2 = TARE
Impinger No. 4	SILICA	~~896.8~~	911.6	23.3	888.3 = TARE
Impinger No. 5					
Impinger No. 6					
Impinger No. 7					
Additional Rinse					
			Net Weight (g)	133.0	

Run No.	2				
Method No.	5/202	Train ID	1B-202-6	Filter No.	30579
	Contents	Tare with Contents (g)	Final (g)	Total (g)	Notes
Impinger No. 1	EMPTY	632.0	719.7	87.7	
Impinger No. 2	EMPTY	604.5	607.8	3.3	
Impinger No. 3	100 ML DI	693.7	709.1	15.4	
Impinger No. 4	SILICA	915.4	935.1	19.7	
Impinger No. 5					
Impinger No. 6					
Impinger No. 7					
Additional Rinse					
			Net Weight (g)	120.1	

Run No.	3				
Method No.	5/202	Train ID	1B-202-8	Filter No.	30594
	Contents	Tare with Contents (g)	Final (g)	Total (g)	Notes
Impinger No. 1	EMPTY	549.0	639.0	90.0	
Impinger No. 2	EMPTY	508.9	508.9	0.0	
Impinger No. 3	100 ML DI	590.1	617.9	27.8	
Impinger No. 4	SILICA	911.1	934.8	23.7	
Impinger No. 5					
Impinger No. 6					
Impinger No. 7					
Additional Rinse					
			Net Weight (g)	141.5	

AIRTECH ENVIRONMENTAL SERVICES INC.

Method 3B, Orsat Analyzer Datasheet

PROJECT NO. 4784

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Client	MPU		
Plant	MANITOWOC, WI		
Location	B-9	Date	9/10/14
Analyzer Type	ORSAT	Leak Check	✓

$$F_O = \frac{(20.9 - O_2\%)}{CO2\%}$$

Run No.	Trial No.	$\%CO_2$	$\%CO_2+\%O_2$	$\%O_2$	F_O	Analyst	Date	Time
Ambient Air	Check	0.02	21.12	21.1		RK	9/10/14	
Run No.	**Trial No.**	**$\%CO_2$**	**$\%CO_2+\%O_2$**	**$\%O_2$**	**F_O**	**Analyst**	**Date**	**Time**
1	1	12.1	19.0	6.9				
	2	12.0	19.0	7.0				
	3	12.2	19.2	7.0				
	Average							
2	1	13.6	18.6	5.0		RK	9/10/14	
	2	13.6	18.8	5.2				
	3	13.7	18.8	5.1				
	Average							
3	1	12.2	19.1	6.9		RK	9/10/14	
	2	12.3	19.0	6.7				
	3	12.2	18.9	6.7				
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							
	1							
	2							
	3							
	Average							

Notes:

Run an ambient air check to verify Oxsorb.

Measurements must be made to the nearest 0.2%.

Three different trails should be performed for each sample.

The differences between the trials must not be greater than 0.2% overall.

Expected F_o Ranges

Anthracite/Lignite	1.015-1.130	Nat. Gas	1.600-1.836
Bituminous	1.083-1.230	Wood Bark	1.000-1.120
Distillate Oil	1.260-1.413	Municiple	
Residual Oil	1.210-1.370	Garbage	1.043-1.177

Laboratory Data

AIRTECH
Environmental
Services Inc.

Methods 5/202 Gravimetric Analytical Report

Performed for
MPU

Project No. 4784
September 26, 2014

Analyst: _____
Riley Kloss

The following data has been reviewed for completeness, accuracy, adherence to method protocol and compliance with quality assurance guidelines.

Reviewer: _____ Date: 9/26/14

1371 BRUMMEL AVE, ELK GROVE VILLAGE, ILLINOIS 60007 - TEL: 630-860-4740
FAX: 847-258-3755

Table of Contents

Project Summary

General

Project Information	
Date Received	9/12/14
Analytical Protocol	EPA Methods 5/202
Number of Samples Received	34
Number of Blanks Received	5

Analytical Equipment

Equipment Information	Manufacturer	Model	Serial No.
Analytical Balance	Ohaus	AV114C	8028031056

Sample Remarks

All samples were analyzed according to EPA Method 5 Section 11 and EPA Method 202 Section 11.

QA/QC

All sample weights were taken until two consecutive weights were within 0.0005g. The analytical balance was calibrated daily in addition to the yearly full scale calibration that was performed by Automated Scale Corporation. These calibrations can be found in the calibration section of the Appendix.

Condition of Samples When Received

Samples were received in good condition.

Table 1. Summary of EPA Methods 5/202, Unit B8

	Run 1	Run 2	Run 3
Filterable PM			
Filter (g)	0.0000	0.0000	0.0000
Front-Half Wash (g)*	0.0059	0.0050	0.0047
Front-Half Particulate (g)	0.0059	0.0050	0.0047
Condensible PM			
Back-Half Inorganic Fraction (g)	0.0112	0.0078	0.0100
Back-Half Organic Fraction (g)	0.0080	0.0126	0.0117
Back-Half Particulate (g)*	0.0140	0.0153	0.0166

Table 2. Summary of EPA Methods 5/202, Unit B9

	Run 1	Run 2	Run 3
Filterable PM			
Filter (g)	0.0000	0.0000	0.0000
Front-Half Wash (g)*	0.0120	0.0050	0.0028
Front-Half Particulate (g)	0.0120	0.0050	0.0028
Condensible PM			
Back-Half Inorganic Fraction (g)	0.0062	0.0089	0.0124
Back-Half Organic Fraction (g)	0.0024	0.0039	0.0018
Back-Half Particulate (g)*	0.0035	0.0077	0.0091

"*" Results have been blank corrected

Appendix

Includes the following:

- *Data Entry*
- *Raw Data*
- *Chain of Custody*
- *Calibration Data*

Data Entry

Includes the following:

- *Filter Data Entry*
- *Front-Half-Rinse Data Entry*
- *Organic Fraction Data Entry*
- *Inorganic Fraction Data Entry*

MPU | **Method 5/202 Parameters** **Boiler 8** | **Project No. 4784**

Method 5/202 Parameters		**Run 1**	**Run 2**	**Run 3**	**Blank**
Filter		30575	30576	30577	
Filter tare weight (g)	Trial 1	0.4595	0.4587	0.4553	
	Trial 2	0.4594	0.4591	0.4555	
	Average	0.4595	0.4589	0.4554	
Filter final weight (g)	Trial 1	0.4591	0.4581	0.4553	
	Trial 2	0.4592	0.4580	0.4554	
	Average	0.4592	0.4581	0.4554	
Filter net weight, m_f (g)		**0.0000**	**0.0000**	**0.0000**	
Front Half Wash	*Beaker ID*	*B1*	*B2*	*B3*	*C4*
Beaker tare weight (g)	Trial 1	4.2516	4.2393	4.2781	4.2355
	Trial 2	4.2516	4.2393	4.2781	4.2353
	Average	4.2516	4.2393	4.2781	4.2354
Beaker final weight (g)	Trial 1	4.2578	4.2444	4.2828	4.2356
	Trial 2	4.2573	4.2444	4.2829	4.2354
	Average	4.2576	4.2444	4.2829	4.2355
Volume of Wash, V_{aw} (ml)		86	85	96	144
Beaker net weight, m_a (g)		**0.0060**	**0.0051**	**0.0047**	**0.0001**
Organic Fraction					
	Beaker ID	*D1*	*D2*	*D3*	*D4*
Weighing tin tare weight (g)	Trial 1	4.2459	4.2511	4.2512	4.2926
	Trial 2	4.2459	4.2514	4.2514	4.2929
	Average	4.2459	4.2513	4.2513	4.2928
Weighing tin final weight (g)	Trial 1	4.2541	4.2638	4.2632	4.2954
	Trial 2	4.2536	4.2640	4.2628	4.2954
	Average	4.2539	4.2639	4.2630	4.2954
Volume of Wash, Vaw (ml)		184	176	194	170
Weighing tin net weight, ma (g)		**0.0080**	**0.0126**	**0.0117**	**0.0027**
Inorganic Fraction					
	Beaker ID	*10*	*11*	*12*	*14*
Weighing tin tare weight (g)	Trial 1	66.0242	65.5230	65.8931	65.7072
	Trial 2	66.0246	65.5230	65.8936	65.7077
	Average	66.0244	65.5230	65.8934	65.7075
Weighing tin final weight (g)	Trial 1	66.0353	65.5306	65.9031	65.7160
	Trial 2	66.0358	65.5309	65.9036	65.7156
	Average	66.0356	65.5308	65.9034	65.7158
Volume of Wash, Vaw (ml)		361	348	376	258
Weighing tin net weight, ma (g)		**0.0112**	**0.0078**	**0.0100**	**0.0084**

MPU | **Method 5/202 Parameters** Boiler 9 | **Project No. 4784**

Method 5/202 Parameters		Run 1	Run 2	Run 3	Blank
Filter		30578	30579	30594	
Filter tare weight (g)	Trial 1	0.4577	0.4569	0.4640	
	Trial 2	0.4581	0.4569	0.4639	
	Average	0.4579	0.4569	0.4640	
Filter final weight (g)	Trial 1	0.4579	0.4554	0.4635	
	Trial 2	0.4576	0.4553	0.4635	
	Average	0.4578	0.4554	0.4635	
Filter net weight, m_f (g)		**0.0000**	**0.0000**	**0.0000**	
Front Half Wash	*Beaker ID*	*B5*	*B6*	*B7*	*C4*
Beaker tare weight (g)	Trial 1	4.2583	4.2406	4.2354	4.2355
	Trial 2	4.2580	4.2405	4.2356	4.2353
	Average	4.2582	4.2406	4.2355	4.2354
Beaker final weight (g)	Trial 1	4.2703	4.2459	4.2385	4.2356
	Trial 2	4.2702	4.2454	4.2382	4.2354
	Average	4.2703	4.2457	4.2384	4.2355
Volume of Wash, V_{aw} (ml)		91	74	105	144
Beaker net weight, m_a (g)		**0.0121**	**0.0051**	**0.0029**	**0.0001**
Organic Fraction					
	Beaker ID	*D5*	*D6*	*D7*	*D8*
Weighing tin tare weight (g)	Trial 1	4.2680	4.2712	4.2325	4.2619
	Trial 2	4.2682	4.2714	4.2327	4.2617
	Average	4.2681	4.2713	4.2326	4.2618
Weighing tin final weight (g)	Trial 1	4.2705	4.2753	4.2344	4.2634
	Trial 2	4.2705	4.2752	4.2343	4.2634
	Average	4.2705	4.2753	4.2344	4.2634
Volume of Wash, Vaw (ml)		191	174	183	120
Weighing tin net weight, ma (g)		**0.0024**	**0.0039**	**0.0018**	**0.0016**
Inorganic Fraction					
	Beaker ID	*16*	*18*	*20*	*21*
Weighing tin tare weight (g)	Trial 1	65.5555	65.5990	65.7281	65.5825
	Trial 2	65.5558	65.5995	65.7285	65.5830
	Average	65.5557	65.5993	65.7283	65.5828
Weighing tin final weight (g)	Trial 1	65.5619	65.6079	65.7409	65.5866
	Trial 2	65.5619	65.6084	65.7405	65.5870
	Average	65.5619	65.6082	65.7407	65.5868
Volume of Wash, Vaw (ml)		330	324	302	247
Weighing tin net weight, ma (g)		**0.0062**	**0.0089**	**0.0124**	**0.0041**

Raw Data

Includes the following:

- *Filter Gravimetric Data Sheets*
- *Beaker Gravimetric Data Sheets*

AIRTECH ENVIRONMENTAL SERVICES INC.

Filter Gravimetric Datasheet

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	4902 Unit 1 M.D. LOAD	Tare	.4625	6/20 BC	.4623	6/23 6:08 BC			✓
		Tech							
Filter ID		Final	0.4676	7/17 10:32 KW	0.4673	7/21 6:49			✓
30574		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	4784 B-8	Tare	.4595	6/20 BC	.4594	6/23 6:07 BC			✓
		Tech							
Filter ID		Final	0.4591	9/17 16:16 RK	0.4592	9/18 9:03 RK			✓
30575		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	4784 B-8	Tare	.4587	6/20 BC	.4591	6/23 6:06 BC			✓
		Tech							
Filter ID		Final	0.4581	9/17 16:17 RK	~~0.4576~~ 0.4580	9/18 ~~8:59~~ 9:04 RK			✓
30576		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	4784 B-8	Tare	.4553	6/20 BC	.4555	6/23 6:06 BC			✓
		Tech							
Filter ID		Final	0.4553	9/17 16:18 RK	0.4554	9/18 9:05 RK			✓
30577		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	4784 B-9	Tare	.4577	6/20 BC	~~.4581~~ .4581	6/23 6:05 BC			✓
		Tech							
Filter ID		Final	0.4579	9/17 16:19 RK	0.4576	9/18 8:59 RK			
30578		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	4784 B-9	Tare	.4569	6/20 BC	.4569	6/23 6:05 BC			✓
		Tech							
Filter ID		Final	0.4554	9/17 16:19 RK	0.4553	9/18 9:00 RK			✓
30579		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	4889 IFBH2	Tare	0.4819	7/10 6:33	0.4818	7/11 6:13			✓
		Tech							
Filter ID		Final	0.4820	7/21 6:37	0.4820	7/21 14:45			✓
30580		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	4889 IFBH2	Tare	0.4828	7/10 6:33	0.4830	7/11 6:14			✓
		Tech							
Filter ID		Final	0.4828	7/21 6:38	0.4829	7/21 14:46			✓
30581		Tech							
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	4889 IFBH	Tare	0.4808	7/10 6:34	0.4806	7/11 6:14			✓
		Tech							
Filter ID		Final	0.4807	7/21 6:38	0.4807	7/21 14:46			✓
30582		Tech							
		Notes							

AIRTECH ENVIRONMENTAL SERVICES INC.

Filter Gravimetric Datasheet

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
		Tare	0.4580	7/10 6:39	0.4578	7/11 6:13			✓
		Tech		″		″			
Filter ID		Final							
		Tech							
30592		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
		Tare	0.4678	7/10 6:39	0.4672	7/11 6:06	0.4675	9/5 14:52	✓
		Tech		″		″		BH2	
Filter ID		Final							
		Tech							
30593		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	4784	Tare	0.4640	7/10 6:40	~~0.45~~	7/11 6:04			✓
		Tech		″	0.4639	″			
Filter ID	B-9	Final	0.4635	9/17 16:20	0.4635	9/18 9:02			✓
30594		Tech		RK		RK			
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	4784	Tare	0.4781	7/10 6:41	0.4779	7/11 6:07			✓
		Tech		″		″			
Filter ID	B-9	Final	0.4973	9/17 16:13	0.4975	9/18 9:08			✓
30595		Tech		RK		RK			
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	4784	Tare	0.4693	7/10 6:41	0.4689	7/11 6:07			✓
		Tech		″		″			
Filter ID	B-9	Final	0.5113	9/17 16:14	0.5123	9/18 9:07	0.5118	9/18 15:07	✓
30596		Tech		RK		RK		RK	
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	4784	Tare	0.4932	7/10 6:42	0.4927	7/11 6:08			✓
		Tech		″		″			
Filter ID	B-9	Final	0.5263	9/17 16:15	0.5263	9/18 9:06			✓
30597		Tech		RK		RK			
		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
		Tare	0.4638	7/10 6:42	0.4635	7/11 6:08			✓
		Tech		″		″			
Filter ID		Final							
		Tech							
30598		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
		Tare	0.4605	7/10 6:43	0.4598	7/11 6:09	0.4601	9/5 14:51	✓
		Tech		″		″		BH2	
Filter ID		Final							
		Tech							
30599		Notes							

Run No.	Project #/Location		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
		Tare	0.4812	7/10 6:43	0.4809	7/11 6:47			
		Tech		″		″			
Filter ID		Final							
		Tech							
30600		Notes							

AIRTECH ENVIRONMENTAL SERVICES INC.

Beaker Gravimetric Datasheet

Project No.	4784	Date Received	9/12/14
Client	MPU	Plant	MANITOWOC, WI

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Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	B-8	5	Tare	4.2516	9/5 13:59	4.2516	9/8 11:36			✓
			Tech		BH2		BH2			
Beaker ID	76+10		Final	4.2578	9/17 15:59	4.2573	9/18 8:43			✓
B 1	86 mls	ACE	Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	B-8	5	Tare	4.2393	9/5 14:00	4.2393	9/8 11:37			✓
			Tech		BH2		BH2			
Beaker ID	75+10		Final	4.2444	9/17 16:06	4.2444	9/18 8:57			✓
B 2	85 mls	ACE	Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	B-8	5	Tare	4.2781	9/5 14:00	4.2781	9/8 11:38			✓
			Tech		BH2		BH2			
Beaker ID	86+10		Final	4.2828	9/17 16:05	4.2829	9/18 8:55			✓
B 3	96 mls	ACE	Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
FB	B-8	5	Tare	4.2615	9/5 14:01	4.2616	9/8 11:39			✓
			Tech		BH2		BH2			
Beaker ID	73+10		Final	4.2625	9/17 16:08	4.2621	9/18 8:56			✓
B 4	83 mls	ACE	Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	B-9	5	Tare	4.2583	9/5 14:02	4.2580	9/8 11:39			✓
			Tech		BH2		BH2			
Beaker ID	81+10		Final	4.2703	9/17 16:11	4.2702	9/19 8:56			✓
B 5	91 mls	ACE	Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	B-9	5	Tare	4.2406	9/5 14:02	4.2405	9/8 11:40			✓
			Tech		BH2		BH2			
Beaker ID	04+10		Final	4.2459	9/17 16:03	4.2454	9/18 8:41			✓
B 6	74 mls	ACE	Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	B-9	5	Tare	4.2354	9/5 14:03	4.2356	9/8 11:41			✓
			Tech		BH2		BH2			
Beaker ID	95+10		Final	4.2378	9/17 16:10	4.2385	9/18 8:51	4.2382	9/19 8:55	✓
B 7	105 mls	ACE	Tech		RK		RK		RK	
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
FB	B-9	5	Tare	4.2590	9/5 14:03	4.2589	9/8 11:41			✓
			Tech		BH2		BH2			
Beaker ID	81+10		Final	4.2595	9/17 16:08	4.2593	9/18 8:52			✓
B 8	91 mls	ACE	Tech		RK		RK			
			Notes							

AIRTECH ENVIRONMENTAL SERVICES INC.

Beaker Gravimetric Datasheet

Project No.	4787	Date Received	9/12/14
Client	MPU	Plant	MANITOWOC, WI

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Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	B-9	5	Tare	4.2578	9/5 14:04	4.2578	9/8 11:30			✓
Beaker ID	91 +10		Tech		BH2		BH2			
C 1		ACE	Final	4.2730	9/17 15:58	4.2727	9/18 8:46			✓
	101 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	B-9	5	Tare	4.2343	9/5 14:05	4.2338	9/8 11:31			✓
Beaker ID	25 +10		Tech		BH2		BH2			
C 2		ACE	Final	4.2678	9/17 15:57	4.2680	9/18 8:48			✓
	35 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	B-9	5	Tare	4.2212	9/5 14:06	4.2213	9/8 11:32			✓
Beaker ID	73+10		Tech		BH2		BH2			
C 3		ACE	Final	4.2397	9/17 16:07	4.2397	9/18 8:54			✓
	83 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
RB			Tare	4.2355	9/5 14:06	4.2353	9/8 11:32			✓
Beaker ID	134+10	ACE	Tech		BH2		BH2			
C 4			Final	4.2356	9/17 15:51	4.2354	9/18 8:45			✓
	144 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
RB			Tare	4.2339	9/5 14:07	4.2339	~~4.2339~~	~~9/8 11:3~~		✓
Beaker ID	98+10	HEX	Tech		BH2		9/8 11:33	BH2		
C 5			Final	4.2342	9/17 16:04	4.2338	9/18 8:56			✓
	108 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
			Tare	4.2518	9/5 14:08	4.2518	9/8 11:34			✓
Beaker ID			Tech		BH2		BH2			
C 6			Final							
	mls		Tech							
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
			Tare	4.2322	9/5 14:09	4.2324	9/8 11:35			✓
Beaker ID			Tech		BH2		BH2			
C 7			Final							
	mls		Tech							
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
			Tare	4.2280	9/5 14:10	4.2281	9/8 11:36			✓
Beaker ID			Tech		BH2		BH2			
C 8			Final							
	mls		Tech							
			Notes							

AIRTECH ENVIRONMENTAL SERVICES INC.

Beaker Gravimetric Datasheet

Project No.	4784	Date Received	9/12/14
Client	MPU	Plant	MANITOWOC, WI

Page		of	

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	B-8	202	Tare	4.2459	9/5 14:11	4.2459	9/8 11:24			✓
			Tech		BH2		BH2			
Beaker ID	174+10	HEX	Final	4.2541	9/17 16:02	4.2536	9/18 8:42			✓
D 1	184 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	B-8	202	Tare	4.2511	9/5 14:12	4.2514	9/8 11:24			✓
			Tech		BH2		BH2			
Beaker ID	166+10	HEX	Final	4.2638	9/17 15:59	4.2640	9/18 8:44			✓
D 2	176 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	B-8	202	Tare	4.2512	9/5 14:12	4.2514	9/8 11:25			✓
			Tech		BH2		BH2			
Beaker ID	184+10	HEX	Final	4.2632	9/17 16:09	4.2628	9/18 8:54			✓
D 3	194 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
FB	B-8	202	Tare	4.2926	9/5 14:13	4.2929	9/8 11:26			✓
			Tech		BH2		BH2			
Beaker ID	160+10	HEX	Final	4.2954	9/17 15:53	4.2954	9/18 8:48			✓
D 4	170 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	B-9	202	Tare	4.2680	9/5 14:14	4.2682	9/8 11:27			✓
			Tech		BH2		BH2			
Beaker ID	181+10	HEX	Final	4.2705	9/17 16:05	4.2705	9/18 8:53			✓
D 5	191 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	B-9	202	Tare	4.2712	9/5 14:15	4.2714	9/8 11:28			✓
			Tech		BH2		BH2			
Beaker ID	164+10	HEX	Final	4.2763	9/17 16:01	4.2753	9/18 8:46	4.2752	9/18 15:09	✓
D 6	174 mls		Tech		RK		RK		RK	
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	B-9	202	Tare	4.2325	9/5 14:15	4.2327	9/8 11:28			✓
			Tech		BH2		BH2			
Beaker ID	173+10	HEX	Final	4.2344	9/17 15:55	4.2343	9/18 8:49			✓
D 7	183 mls		Tech		RK		RK			
			Notes							
Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
FB	B-9	202	Tare	4.2619	9/5 14:16	4.2617	9/8 11:29			✓
			Tech		BH2		BH2			
Beaker ID	110+10	HEX	Final	4.2648	9/17 16:00	4.2634	9/18 8:43	4.2634	9/18 15:10	✓
D 8	120 mls		Tech		RK		RK		RK	
			Notes							

AIRTECH ENVIRONMENTAL SERVICES INC.

Beaker Gravimetric Datasheet

Project No.	4784	Date Received	9/12/14
Client	MPU	Plant	MANITOWOC, WI

Page ____ of ____

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	B-8	202	Tare	66.0248	8/8 13:24	66.0242	8/9 10:58	66.0246	8/11 7:19	✓
			Tech				BH2		"	
Beaker ID	351+10	D1	Final	66.0864	9/18 5:55	66.0353	9/19 7:44	66.0358	9/19 13:45	✓
			Tech		BC		"		RK	
10	361 mls		Notes	B-10	glass in beaker					

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	B-8	202	Tare	65.5231	8/8 13:25	65.5224	8/9 10:58	65.5230	8/11 7:18	✓
			Tech	"	"		BH2		"	
Beaker ID	338+10	D1	Final	65.5306	9/19 5:55	65.5309	9/19 12:01			✓
			Tech		BC		RK			
11	348 mls		Notes	B-25						

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	B-8	202	Tare	65.8938	8/8 13:25	65.8931	8/9 10:57	65.8936	8/11 7:18	✓
			Tech		"		BH2		"	
Beaker ID	366+10	D1	Final	65.9031	9/19 5:56	65.9036	9/19 12:01			✓
			Tech		BC		RK			
12	376 mls		Notes	B-29						

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
FB	B-8	202	Tare	65.7081	8/8 13:26	65.7072	8/9 10:56	65.7077	8/11 7:17	✓
			Tech		"		BH2		"	
Beaker ID	248+10	D1	Final	65.7160	9/18 14:21	65.7156	9/19 5:56	~~65.71~~	~~9/19~~	✓
			Tech		RK		BC			
14	258 mls		Notes	B-30						

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
1	B-9	202	Tare	65.5565	8/8 13:27	65.5555	8/9 10:56	65.5558	8/11 7:17	✓
			Tech		"		BH2		"	
Beaker ID	320+10	D1	Final	65.5619	9/19 5:57	65.5624	9/19 12:03			✓
			Tech		BC		RK			
16	330 mls		Notes							

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
2	B-9	202	Tare	65.5999	8/8 13:27	65.5990	8/9 10:55	65.5995	8/11 7:16	✓
			Tech		"		BH2		"	
Beaker ID	314+10	D1	Final	65.6079	9/19 5:58	65.6084	9/19 12:04			✓
			Tech		BC		RK			
18	324 mls		Notes							

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
3	B-9	202	Tare	65.7289	8/8 13:28	65.7281	8/9 10:54	65.7285	8/11 7:20	✓
			Tech		"		BH2		"	
Beaker ID	292+10	D1	Final	65.7409	9/18 14:22	65.7405	9/19 5:58	~~65.7409~~	~~9/19 11:59~~	✓
			Tech		RK		BC		RK	
20	302 mls		Notes							

Run No.	Location/Volume	Method/ Reagent		Weight	Date / Time	Weight	Date / Time	Weight	Date / Time	Good
FB	B-9	202	Tare	65.5835	8/8 13:28	65.5825	8/9 10:56	65.5830	8/11 7:16	✓
			Tech		"		BH2		"	
Beaker ID	237+10	D1	Final	65.5874	9/18 14:20	65.5866	9/19 6:00	65.5870	9/19 12:02	✓
			Tech		RK		BC		RK	
21	247 mls		Notes							

Chain of Custody

Includes the following:

- *Chain of Custody*

AIRTECH ENVIRONMENTAL SERVICES INC.
Chain of Custody

No. 5205

Project Number	4784	Location	B-8 /
Client	MPU	Date	9/11/14
Plant	MANITOWOC, WI	Completed By	RILEY KLOSS
Comments:		Page	1 of ~~2~~ 3

ID No.	Run No.	Date	Sample Description	Analysis Requested: M-5	Analysis Requested: M-202	Notes
30575	1	9/9/14	FILTER	X		
	1	9/9/14	IMP CATCH + DI RINSE		X	
	1	9/9/14	ACE + HEX RINSE		X	
	1	9/9/14	F1/2 ACE RINSE	X		
	1	9/9/14	CPM FILTER		X	
30576	2	9/9/14	FILTER	X		
	2	9/9/14	IMP CATCH + DI RINSE		X	
	2	9/9/14	ACE + HEX RINSE		X	
	2	9/9/14	F1/2 ACE RINSE	X		
	2	9/9/14	CPM FILTER		X	
30577	3	9/9/14	FILTER	X		
	3	9/9/14	IMP CATCH + DI RINSE		X	
	3	9/9/14	ACE + HEX RINSE		X	
	3	9/9/14	F1/2 ACE RINSE	X		
	3	9/9/14	CPM FILTER		X	
	FB	9/9/14	IMP CATCH + DI RINSE		X	

Relinquished By (signature)	[signature]	Relinquished By (signature)		Carrier	
(printed)	RILEY KLOSS	(printed)		Laboratory	
Date/Time	9/12/14 8:35	Date/Time		Contact	
Accepted By (signature)	[signature]	Accepted By (signature)		Address	
(printed)	RILEY KLOSS	(printed)		Phone	
Date/Time	9/12/14 10:05	Date/Time		Fax	
				Date/Time	

AIRTECH Environmental Services Inc.

Airtech Environmental Services Inc.
1371 Brummel Ave
Elk Grove Village, IL 60007
Phone: (630) 860-4740 • Fax: (847) 258-3755

AIRTECH ENVIRONMENTAL SERVICES INC.
Chain of Custody

No. 5204

Project Number	4784	Location	B-8 / B-9
Client	MPU	Date	9/11/14
Plant	MANITOWOC, WI	Completed By	RILEY KLOSS

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Comments:

ID No.	Run No.	Date	Sample Description	M-5	M-202							Notes
	FB	9/9/14	ACE + HEX RINSE		X							
	FB	9/9/14	F1/2 ACE RINSE	X								
	FB	9/9/14	CPM FILTER		X							
30578	1	9/10/14	FILTER	X								
	1	9/10/14	IMP CATCH + DI RINSE		X							
	1	9/10/14	ACE + HEX RINSE		X							
	1	9/10/14	F1/2 ACE RINSE	X								
	1	9/10/14	CPM FILTER		X							
30579	2	9/10/14	FILTER	X								
	2	9/10/14	IMP CATCH + DI RINSE		X							
	2	9/10/14	ACE + HEX RINSE		X							
	2	9/10/14	F1/2 ACE RINSE	X								
	2	9/10/14	CPM FILTER		X							
30594	3	9/10/14	FILTER	X								
	3	9/10/14	IMP CATCH + DI RINSE		X							
	3	9/10/14	ACE + HEX RINSE		X							

Relinquished By (signature)	[signature]	Relinquished By (signature)		Carrier	
(printed)	RILEY KLOSS	(printed)		Laboratory	
Date/Time	9/12/14 8:35	Date/Time		Contact	
Accepted By (signature)	[signature]	Accepted By (signature)		Address	
(printed)	RILEY KLOSS	(printed)		Phone	
Date/Time	9/12/14 10:05	Date/Time		Fax	
				Date/Time	

AIRTECH Environmental Services Inc.

Airtech Environmental Services Inc.
1371 Brummel Ave
Elk Grove Village, IL 60007
Phone: (630) 860-4740 • Fax: (847) 258-3755

AIRTECH ENVIRONMENTAL SERVICES INC.
Chain of Custody

No. 5195

Project Number	4784	Location	B-9
Client	MPU	Date	9/11/14
Plant	MANITOWOC, WI	Completed By	RILEY KLOSS

Comments:

Analysis Requested: M-5, M-202

Page 3 of 3

ID No.	Run No.	Date	Sample Description	M-5	M-202							Notes
	3	9/10/14	F1/2 ACE RINSE	X								
	3	9/10/14	CPM FILTER		X							
	FB	9/10/14	IMP CATCH + DI RINSE		X							
	FB	9/10/14	ACE + HEX RINSE		X							
	FB	9/10/14	F1/2 ACE RINSE	X								
	FB	9/10/14	CPM FILTER		X							
	RB	9/11/14	ACETONE REAGENT BLANK	X								
	RB	9/11/14	HEXANE REAGENT BLANK	X								
30595	1	9/11/14	FILTER	X								
	1	9/11/14	F1/2 ACE RINSE	X								
30596	2	9/11/14	FILTER	X								
	2	9/11/14	F1/2 ACE RINSE	X								
30597	3	9/11/14	FILTER	X								
	3	9/11/14	F1/2 ACE RINSE	X								

Relinquished By (signature)	Riley Kloss	Relinquished By (signature)		Carrier	
(printed)	RILEY KLOSS	(printed)		Laboratory	
Date/Time	9/12/14 8:35	Date/Time		Contact	
Accepted By (signature)	Riley Kloss	Accepted By (signature)		Address	
(printed)	RILEY KLOSS	(printed)		Phone	
Date/Time	9/12/14 10:05	Date/Time		Fax	
				Date/Time	

MPU04397

AIRTECH Environmental Services Inc.

Airtech Environmental Services Inc.
1371 Brummel Ave
Elk Grove Village, IL 60007
Phone: (630) 860-4740 • Fax: (847) 258-3755

Calibration Data

Includes the following:

- *Daily Analytical Balance Calibration Log*
- *Yearly Analytical Balance Test and Calibration Certificate*

Scale ID	Ohaus AV114C
Units of Measure	grams

Full Cal Test Date	4/4/14

Date	Tech Initials	100.0000g	5.0000g	0.1000g	Barometric Pressure (in. Hg)	Relative Humidity (%)	Ambient Temp (°F)	Notes
7/9/14	JC	100.0000	5.0000	0.1000	29.19	44	72	
7/10/14	JC	100.0000	5.0000	0.0998	29.42	44	76	
7/11/14	JC	100.0001	4.9999	0.0999	29.47	47	75	
7/16/14	AD	100.0001	5.0001	0.1000	29.33	46	73	
7/17/14	JC	100.0000	5.0000	0.1000	29.4	46	73	
7/21/14	JC	99.9999	5.0000	0.0999	29.39	46	73	
7/23/14	RK	100.0000	5.0002	0.1003	29.45	46	73	
7/25/14	JC	100.0000	5.0001	0.1001	29.23	47	73	
7/28/14	JC	100.0000	4.9998	0.0999	29.28	47	73	
7/29/14	JC	100.0000	5.0001	0.1001	29.32	40	73	
8/6/14	JC	100.0000	5.0000	0.0999	28.37	47	73	
8/7/14	JC	99.9999	4.9998	0.0998	29.59	47	73	
8/9/14	BH2	100.0000	5.0001	0.0999	29.38	49	73	
8/11/14	JC	100.0000	4.9998	0.0998	29.19	48	73	
8/14/14	JC	100.0001	5.0002	0.1002	29.37	43	73	
8/15/14	RK	99.9999	5.0000	0.0999	29.38	44	73	
8/18/14	RK	99.9999	5.0002	0.0999	29.22	48	74	
8/19/14	BC	99.9999	5.0003	.1001	29.25	42	74	
8/20/14	BC	99.9998	4.9999	0.0999	29.35	52	71.6	
8/21/14	JC	100.0000	4.9999	0.1001	29.24	41	73	
8/22/14	JC	100.0000	5.0000	0.1000	29.22	49	73	
9/2/14	JC	100.0001	4.9999	0.1000	29.17	49	73	
9/3/14	JC	99.9999	4.9999	0.0998	29.31	47	73	
9/5/14	JC	100.0000	4.9999	0.0998	29.25	48	73	
9/8/14	JC	100.0000	5.0002	0.0997	29.43	47	73	
9/15/14	JC	99.9999	4.9998	0.0999	29.43	47	70	
9/16/14	RK	100.0000	5.0001	0.1000	29.49	47	69	
9/17/14	RK	100.0000	4.9998	0.0998	29.31	42	70	
9/18/14	RK	99.9998	4.9999	0.1000	29.43	42	72	
9/19/14	BC	100.0000	5.0003	0.1000	29.45	44	72	
9/22/14	BH2	99.9999	5.0000	0.1000	29.51	46	71	

Scale ID	Ohaus AV114C
Units of Measure	grams

Full Cal Test Date	4/4/14

Date	Tech Initials	100.0000g	5.0000g	0.1000g	Barometric Pressure (in. Hg)	Relative Humidity (%)	Ambient Temp (°F)	Notes
4-17-14	BHZ	100.0001	5.0000	0.1000	29.44	23	68	
4-18-14	JC	100.0001	5.0000	0.1000	29.62	31	70	
4-23-14	JC	100.0000	5.0002	0.1001	29.45	31	70	
4-30-14	SH	100.0000	5.0001	0.1000	29.03	39	71	
5-2-14	JC	100.0000	5.0000	0.1000	29.06	40	69	
5-6-14	JC	100.0000	5.0000	0.1000	29.21	36	73	
5-19-14	SH	100.0000	5.0000	0.1000	29.50	40	71	
5-22-14	JC	100.0000	5.0000	0.0999	29.38	42	76	
5-23-14	BrK	100.0001	5.0000	0.1001	29.48	44	73	
5-24-14	JC	100.0000	5.0000	0.1001	29.44	42	76	
5-27-14	JC	100.0001	5.0002	0.1001	29.23	48	78	
5-28-14	JC	99.9999	4.9999	0.0999	29.24	46	74	
5-29-14	JC	99.9999	4.9999	0.0999	29.38	39	75	
5-30-14	JC	100.0001	5.0002	0.0999	29.42	40	79	
6-4-14	RK	100.0000	4.9999	0.0999	29.14	48	72	
6-5-14	JC	100.0001	4.9999	0.0999	29.25	47	73	
6-6-14	JC	100.0000	5.0001	0.0998	29.30	36	73	
6-8-14	JC	99.9999	5.0002	0.1002	29.30	43	74	
6-9-14	MH	99.9999	4.9999	0.0999	29.29	41	74	
6-10-14	MH	100.0000	4.9999	0.1000	29.21	45	78.9	
6/12/14	JC	100.0000	5.0000	0.0999	29.08	48	74	
6/16/14	JC	100.0001	5.0001	0.1000	29.34	44	75	
6/16/14	JC	[illegible]	5.0002	0.1000	29.37	48	73	
6/19/14	JC	100.0000	5.0000	0.0998	29.39	42	73	
6/20/14	JC	99.9999	4.9999	0.1000	29.26	43	73	
6/23/14	BC	100.0001	5.0000	0.1001	29.15	52	73	
6/24/14	JC	100.0001	4.9999	0.1000	29.15	48	73	
6/27/14	JC	99.9999	4.9999	0.1000	29.3	48	73	
6/28/2014	KW	100.0000	4.9999	0.1000	29.33	58	77	
6/30/14	JC	100.0000	5.0001	0.1000	29.15	43	76	
7/1/14	JC	100.0001	5.0000	0.1000	29.02	48	73	
7/2/14	JC	99.9999	5.0001	0.1000	29.15	47	73	
7/3/14	RK	100.0000	4.9998	0.9998	29.43	48	72	5.0001 RK
7/5/14	JC	99.9999	5.0000	0.0999	29.45	48	72	

AUTOMATED SCALE CORPORATION

202 W. Fay Ave. Addison, IL 60101 800/498-6650

TEST & CALIBRATION CERTIFICATE

L-A-B Accredited: Certificate #L1053-1

Tests and/or calibrations shall stop when environmental conditions will jeopardize the results. (rain, wind, vibration, temperature, and etc.)

Standards Used: Traceable through NIST to the SI units

Test equipment and weight (s) certificates available on request

Client Name & Address	Location (Plant and / or Dept.)	Procedure used: 5.4-02 Process Control
Air Tech	Lab	Uncertainty of measurement (UM) Yes [ ] No [X]
601 A Country Club	NA	Temperature Yes [X] No [ ]
Bensenville	Contact: Jim L	Identified metrological reference: NIST Handbook 44

Manufacturer	Model #	Serial #	Capacity X Grad.
Indicator: Ohaus	AV114C	8028031056	110g x .0001
Platform: NA	NA	NA	NA

Inspection Cycle: 365 day Equipment ID: NA

Scale Platform Corner Test

Parallelogram Side/Front Test

	Indicator	
1	C	2
	See Shift Test Below	
A		B
3	D	4

Cert# Client Tolerance (.1)% As Found/Left Shift Test

Date		A	B	C	D	Zero	As Found AMT 1	As Found AMT 2	As Left AMT 2	As Left AMT 1	Pass/Fail P/F	UM	Temp: F°	Tech	Traceable Cert. #/ Wt. ID
4.13.10	F	50.0000	50.0000	50.0000	50.0000	0	50.0000	100.0000	100.0000	50.0000	P	NA	74	JJ	# 153801H
	L	50.0000	50.0000	50.0000	50.0000	0									ID ASTMOM
4-12-11	F	50.0000	50.0000	50.0000	50.0000	0	50.0000	100.0001	100.0000	50.0000	P	NA	74	AR	# IS 38014
	L	50.0000	50.0000	50.0000	50.0000	0									ID ASTMOM
4-5 12	F	50.0004	50.0004	50.0004	50.0004	0	50.0004	100.0001	100.0000	50.0000	P	NA	70	AZ	# 176301H
	L	50.0000	50.0000	50.0000	50.0000	0									ID ASTMOM
4 3 13	F	50.0006	50.0006	50.0006	50.0006	0	50.0006	100.0012	100.0000	50.0000	P	NA	70	RR	# 176301H
	L	50.0000	50.0000	50.0000	50.0000	0									ID ASTMOM
4-7-14	F	50.0001	50.0001	50.0001	50.0001	0	50.0001	100.0002	100.0000	50.0000	P	NA	71	RST	# 1763044
	L	50.0000	50.0000	50.0000	50.0000	0									ID ASTMO-M
	F														#
	L														ID
	F														#
	L														ID
	F														#
	L														ID
	F														#
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Comments:

Pass/Fail compliance statements are the opinions of Automated Scale Corp. based on data from measurements made, procedure utilized, professional experience, and the uncertainty associated with this calibration. It is the responsibility of the user of this equipment to determine if the results identified meet specific requirements for its intended application. Associated uncertainty (as applicable) is expressed at a confidence level of approximately 95% with a coverage factor of K=2.

LAB NO. 2014-1034-26

DATE REC'D 09/18/14

STANDARD LABORATORIES, INC.

1530 N. Cullen Avenue
Evansville, IN 47715

MANITOWOC PUBLIC UTILITIES
P.O. BOX 1090
MANITOWOC, WI 54221
ATTN: TOM REED

SAMPLE IDENTIFICATION

Boiler 8 Stack Test

Note: Values Calculated

DATE REPORTED: 09/30/14

	% MOISTURE	% ASH	% VOLATILE	% FIXED CARBON	BTU/LBS	% SULFUR
AS REC'D	6.22	4.00	XXXX	XXXX	11983	2.40
DRY BASIS	------	4.27	XXXX	XXXX	12778	2.56
M-A-FREE					13348	

ULTIMATE ANALYSIS

	% As Received	Dry Basis
Carbon	58.20	62.06
Hydrogen	4.95	5.28
Nitrogen	0.78	0.83
Ash	4.00	4.27
Sulfur	2.40	2.56
Oxygen	23.45	25.00
Moisture	6.22	

Respectfully Submitted

FORM # 21

LAB NO. 2014-1034-27

DATE REC'D 09/18/14

STANDARD LABORATORIES, INC.

1530 N. Cullen Avenue
Evansville, IN 47715

MANITOWOC PUBLIC UTILITIES
P.O. BOX 1090
MANITOWOC, WI 54221
ATTN: TOM REED

SAMPLE IDENTIFICATION

Boiler 9 Stack Test

Note: Values Calculated

DATE REPORTED: 09/30/14

	% MOISTURE	% ASH	% VOLATILE	% FIXED CARBON	BTU/LBS	% SULFUR
AS REC'D	9.78	3.09	XXXX	XXXX	12155	3.49
DRY BASIS	------	3.42	XXXX	XXXX	13473	3.87
M-A-FREE					13950	

ULTIMATE ANALYSIS

	% As Received	Dry Basis
Carbon	64.82	71.85
Hydrogen	4.11	4.56
Nitrogen	1.15	1.27
Ash	3.09	3.42
Sulfur	3.49	3.87
Oxygen	13.56	15.03
Moisture	9.78	

Respectfully Submitted

FORM # 21

MPU04403

LAB NO. 2014-1034-17

DATE REC'D 09/17/14

DATE SAMPLED --------

SAMPLED BY CLIENT

STANDARD LABORATORIES, INC.

1530 N. Cullen Avenue
Evansville, IN 47715

MANITOWOC PUBLIC UTILITIES
P.O. BOX 1090
MANITOWOC, WI 54221
ATTN: TOM REED

SAMPLE IDENTIFICATION

PC/STACKTEST CHARCOAL
09/9-10/14

DATE REPORTED: 09/29/14

	% MOISTURE	% ASH	% VOLATILE	% FIXED CARBON	BTU/LBS	% SULFUR
AS REC'D	10.45	0.38	XXXX	XXXX	13594	5.40
DRY BASIS	------	0.42	XXXX	XXXX	15180	6.03
M-A-FREE					15244	

ULTIMATE ANALYSIS

	% As Received	Dry Basis
Carbon	68.35	76.33
Hydrogen	3.31	3.70
Nitrogen	1.39	1.55
Ash	0.38	0.42
Sulfur	5.40	6.03
Oxygen	10.72	11.97
Moisture	10.45	

Respectfully Submitted

FORM # 21

MPU04404

LAB NO. 2014-1034-18

DATE REC'D 09/17/14

DATE SAMPLED --------

SAMPLED BY CLIENT

STANDARD LABORATORIES, INC.

1530 N. Cullen Avenue
Evansville, IN 47715

MANITOWOC PUBLIC UTILITIES
P.O. BOX 1090
MANITOWOC, WI 54221
ATTN: TOM REED

SAMPLE IDENTIFICATION

B8 STACK TEST PAPER
09/09/14

DATE REPORTED: 09/29/14

	% MOISTURE	% ASH	% VOLATILE	% FIXED CARBON	BTU/LBS	% SULFUR
AS REC'D	2.44	5.72	XXXX	XXXX	10616	0.04
DRY BASIS	------	5.86	XXXX	XXXX	10882	0.04
M-A-FREE					11559	

ULTIMATE ANALYSIS

	% As Received	Dry Basis
Carbon	47.35	48.53
Hydrogen	6.50	6.66
Nitrogen	0.10	0.10
Ash	5.72	5.86
Sulfur	0.04	0.04
Oxygen	37.85	38.81
Moisture	2.44	

Respectfully Submitted

FORM # 21

MPU04405

LAB NO. 2014-1034-19

DATE REC'D 09/17/14

DATE SAMPLED --------

SAMPLED BY CLIENT

STANDARD LABORATORIES, INC.

1530 N. Cullen Avenue
Evansville, IN 47715

MANITOWOC PUBLIC UTILITIES
P.O. BOX 1090
MANITOWOC, WI 54221
ATTN: TOM REED

SAMPLE IDENTIFICATION

B9 STACK TEST PAPER
09/10/14

DATE REPORTED: 09/29/14

	% MOISTURE	% ASH	% VOLATILE	% FIXED CARBON	BTU/LBS	% SULFUR
AS REC'D	9.10	5.15	XXXX	XXXX	8972	0.21
DRY BASIS	------	5.67	XXXX	XXXX	9870	0.23
M-A-FREE					10463	

ULTIMATE ANALYSIS

	% As Received	Dry Basis
Carbon	55.12	60.64
Hydrogen	5.95	6.55
Nitrogen	0.39	0.43
Ash	5.15	5.67
Sulfur	0.21	0.23
Oxygen	24.08	26.48
Moisture	9.10	

Respectfully Submitted

FORM # 21

MPU04406

LAB NO. 2014-1034-20

DATE REC'D 09/17/14

DATE SAMPLED --------

SAMPLED BY CLIENT

STANDARD LABORATORIES, INC.

1530 N. Cullen Avenue
Evansville, IN 47715

MANITOWOC PUBLIC UTILITIES
P.O. BOX 1090
MANITOWOC, WI 54221
ATTN: TOM REED

SAMPLE IDENTIFICATION

STACK TEST COAL
09/9-10/14

DATE REPORTED: 09/29/14

	% MOISTURE	% ASH	% VOLATILE	% FIXED CARBON	BTU/LBS	% SULFUR
AS REC'D	8.23	10.73	XXXX	XXXX	11606	1.21
DRY BASIS	------	11.69	XXXX	XXXX	12647	1.32
M-A-FREE					14321	

ULTIMATE ANALYSIS

	% As Received	Dry Basis
Carbon	66.61	72.58
Hydrogen	4.31	4.70
Nitrogen	1.45	1.58
Ash	10.73	11.69
Sulfur	1.21	1.32
Oxygen	7.46	8.13
Moisture	8.23	

Respectfully Submitted

FORM # 21

MPU04407

Calibration Data

Airtech Environmental Services, Inc.
Meter Box Full Test Calibration

Date: 6/16/2014

Operator: j burton

Meter Box ID M-29				Meter Box ΔH@			1.8063	Meter Box Y_d			1.0031	Barometric Pressure (in. Hg.)			29.50
Time	Orifice Data				Meter Box Data								Results		
θ (min)	K'	Vacuum	T_{amb}	V_{cr}	$V_{initial}$	V_{final}	V_d	ΔH	T_i	T_o	T_{avg}	V_{metd}	Q	Y_d	ΔH@
5.0	0.7936	18.0	85	5.014	275.10	280.38	5.28	3.30	105	91	98	4.965	1.003	1.0100	1.775
5.0	0.7936	18.0	85	5.014	280.38	285.71	5.33	3.30	107	92	99.5	4.998	1.003	1.0032	1.746
5.0	0.7936	18.0	85	5.014	285.71	291.03	5.34	3.30	108	94	101.0	4.994	1.003	1.0040	1.744
5.0	0.5783	20.0	85	3.654	293.50	297.40	3.90	1.80	107	95	101.0	3.634	0.731	1.0055	1.784
5.0	0.5783	20.0	85	3.654	297.40	301.34	3.94	1.80	107	96	101.5	3.668	0.731	0.9962	1.749
5.0	0.5783	20.0	85	3.654	301.34	305.27	3.93	1.80	107	97	102.0	3.655	0.731	0.9996	1.760
5.0	0.4458	22.0	86	2.814	306.60	309.62	3.02	1.10	107	98	102.5	2.802	0.563	1.0045	1.823
5.0	0.4458	22.0	86	2.814	309.62	312.65	3.03	1.10	107	98	102.5	2.811	0.563	1.0012	1.811
5.0	0.4458	22.0	86	2.814	312.65	315.70	3.05	1.10	107	99	103.0	2.827	0.563	0.9955	1.789
5.0	0.3456	23.0	86	2.182	316.60	318.94	2.34	0.69	107	100	103.5	2.165	0.436	1.0078	1.908
5.0	0.3456	23.0	86	2.182	318.94	321.29	2.35	0.69	107	101	104.0	2.172	0.436	1.0044	1.893
5.0	0.3456	23.0	86	2.182	321.29	323.64	2.35	0.69	107	102	104.5	2.170	0.436	1.0053	1.895
													Average	1.0031	1.8063

Nomenclature	
K'	Critical Orifice Coefficient
T_{amb}	Ambient Temperature (°F)
V_{cr}	Volume Through Orifice (scf)
V_d	Gas Meter Volume (ft^3)
ΔH	Orifice Pressure Differential (in. H_2O)
T_i	Meter Inlet Temperature (°F)
T_o	Meter Outlet Temperauture (°F)
T_{avg}	Average Meter Box Temperature (°F)
V_{metd}	Volume Metered Standardized (scf)
Q	Flow Rate (scfm)
Y_d	Meter Correction Factor (dimensionless)
ΔH@	ΔH yielding 0.75 scfm

Vacuum Guage (In. Hg.)		Thermometers (°F)				Equations
Standard	Vacuum Gauge	Standard	Check. 1	Check. 2	Check. 3	$V_{cr} = \frac{K' * P_b * \theta}{(T_{amb} + 460)^{0.5}}$
5	5.0	32	33	33	32	$V_{metd} = \frac{17.64 * V_d * (P_b + (\Delta H/13.6))}{(T_{avg} + 460)}$
10	10.0	50	51	51	51	$Q = V_{cr} / \theta$
15	15.0	100	101	101	101	$Y_d = V_{cr} / V_{metd}$
20	20.0	150	150	151	151	$\Delta H@ = \frac{.0319 * \Delta H * (T_{avg} + 460) * \theta^2}{P_b * Y_d^2 * V_m^2}$
25	25.0	212	213	213	212	
		250	251	251	250	
		300	301	302	300	
		350	351	352	350	
		400	401	402	401	
		500	501	501	500	
		600	601	600	600	

MPU044409

Airtech Environmental Services
Meter Post Calibration

Average Field Sample Rate (cfm)	1.050	Date	9/17/2014
Highest Field Vacuum (inches Hg)	15	Client	MPU
Critical Orifice ID	BB55	Project No.	4784CV
Orifice Flow Rate (cfm)	0.586	Meter ID	M-29

	Run 1	Run 2	Run 3
Initial Volume (ft^3)	758.80	761.73	764.65
Final Volume (ft^3)	761.73	764.65	767.58
Volume Metered (ft^3)	2.93	2.92	2.93
DGM Inlet Temperature (°F)	70	72	74
DGM Outlet Temperature (°F)	66	67	67
Average DGM Temperature (°F)	68.0	69.5	70.5
Ambient Temperature (°F)	68	68	68
Elapsed Time (min.)	5	5	5
ΔH (Inches H_2O)	1.05	1.05	1.05
Barometric Pressure (inches Hg)	29.5	29.5	29.5
Pump Vacuum (inches Hg)	22	22	22
K'	0.4458	0.4458	0.4458
Vcr (ft^3)	2.862	2.862	2.862
Vmstd (ft^3)	2.895	2.877	2.882
Post Test Yc	0.9884	0.9946	0.9931
Full Test Yd	1.0031	1.0031	1.0031
% Difference	1.47	0.85	1.00
Average % Difference			1.11

Airtech Environmental Services, Inc.
S-Type Pitot Tube Inspection Form

Date	2/26/14
Pitot ID	AE5-10-5
Operator	j burton

	Measured	Allowed
Outside Tube Diameter - Dt (inches)	0.250	NA
Base To Opening Distance - Pa (inches)	0.338	NA
Base To Opening Distance - Pb (inches)	0.338	NA
Pa/Dt	1.35	1.05-1.50
Pb/Dt	1.35	1.05-1.50
Angle α1(°)	0.2	10
Angle α2(°)	1	10
Angle B1(°)	0.5	5
Angle B2(°)	2.5	5
Opening to Opening Distance Pa+Pb (inches)	0.676	NA
Angle Z (°)	0.2	NA
z (inches)	0.002	0.125
Angle W (°)	0.3	NA
w (inches)	0.004	0.031

Note Any Damage, Nicks or Dents to the Pitot Tube

Is the Pitot Tube Part of an Assembly? Yes

If Yes, Complete the Section Below

Pitot	Measured	Minimum
Distance From Nozzle (inches)	NA	0.75 in.
Pitot to Thermocouple Distance (inches)	2.5	2 in.
Pitot to Sample Probe Distance (inches)	6	3 in.

Does the Pitot Tube Meet the Above Requirements?	Yes
Is the Pitot Tube Free of Damage?	Yes

If Yes to Both, a Pitot Tube Coefficient of 0.84 is Assigned
If No to Either, then the Pitot Tube Must be Calibrated

AIRTECH ENVIRONMENTAL SERVICES INC.

Nozzle Calibration Datasheet

Client	MPU	Job No.	4784
Plant	MANITOWOC, WI		

	Nozzle 1	Nozzle 2	Nozzle 3
Date	9/9/14		
Nozzle ID	.25		
Operator	RK		
Test Location	B8		
Run Number (s)	1		
Diameter 1	.251		
Diameter 2	.253		
Diameter 3	.255		
Average	.253		

	Nozzle 4	Nozzle 5	Nozzle 6
Date			
Nozzle ID			
Operator			
Test Location			
Run Number (s)			
Diameter 1			
Diameter 2			
Diameter 3			
Average			

Notes:
Measurements must be made to the nearest 0.001 inches.
Three different diameters should be measured.
The difference between the high and low measurement must be less than 0.004 inches.

Signed  Date 9/9/14

AIRTECH ENVIRONMENTAL SERVICES INC.

Nozzle Calibration Datasheet

Client	MPU	Job No.	4784
Plant	Manitowoc, WI		

	Nozzle 1	Nozzle 2	Nozzle 3
Date	9-10-14		
Nozzle ID	.22		
Operator	BrK		
Test Location	B9		
Run Number (s)	1, 2, 3		
Diameter 1	.221		
Diameter 2	.220		
Diameter 3	.219		
Average	.220		

	Nozzle 4	Nozzle 5	Nozzle 6
Date			
Nozzle ID			
Operator			
Test Location			
Run Number (s)			
Diameter 1			
Diameter 2			
Diameter 3			
Average			

Notes:
Measurements must be made to the nearest 0.001 inches.
Three different diameters should be measured.
The difference between the high and low measurement must be less than 0.004 inches.

Signed _____ Date 9-10-14

Process Data

End of Report